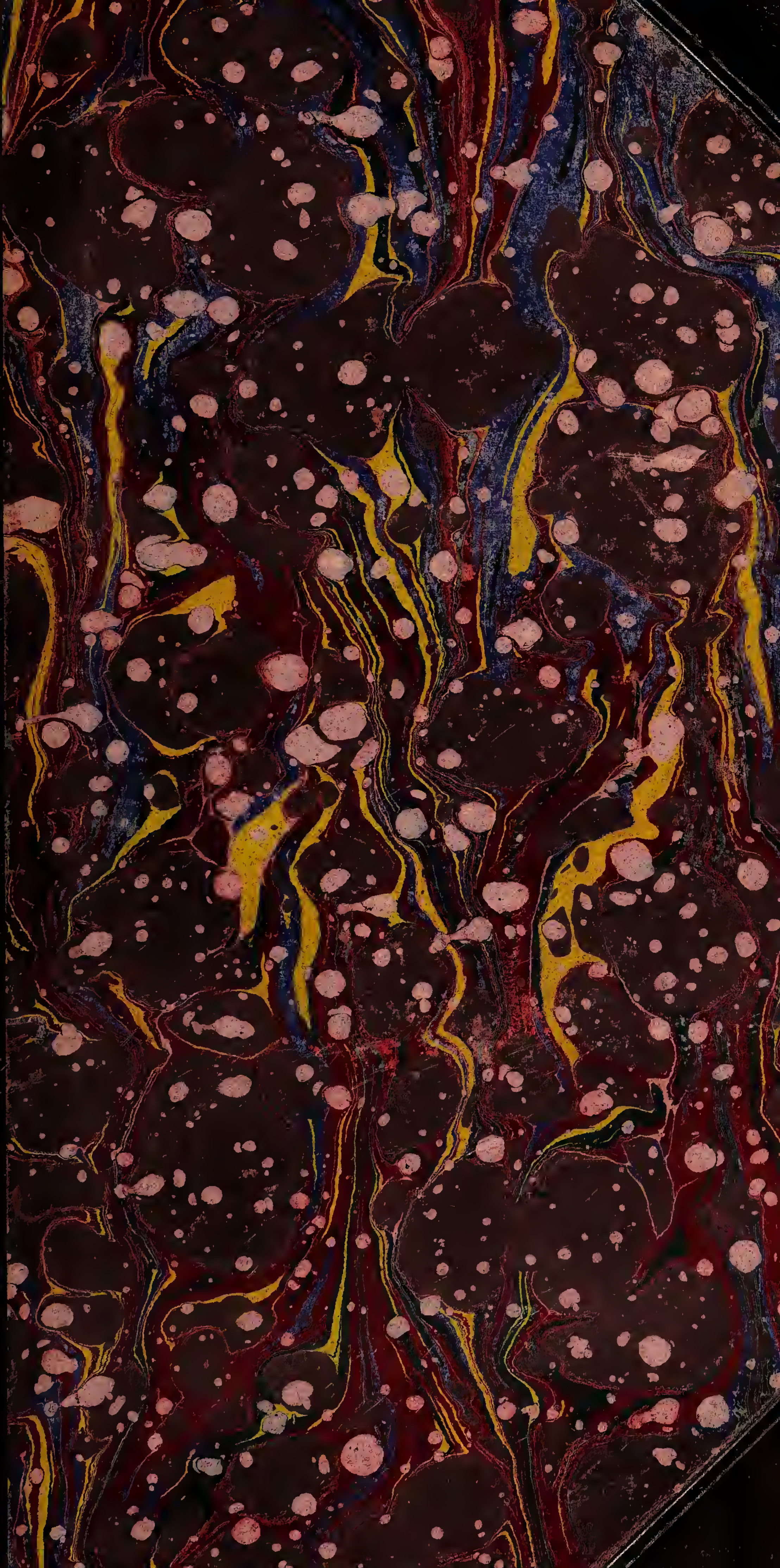

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HYDROLOGIA PHILOSOPHICA

OR,

An ACCOUNT of

ILMINGTON WATERS

In *Warwick-ſhire*;

With Directions for the Drinking of the ſame.

Together with ſome Experimental Obſervations touching the Original of Compound Bodies.

By SAM. DERHAM Bachelour in Phyſick lately of *Magd. Hall. OXON.*

OXFORD,
Printed by *Leon. Lichfield*, Printer to the Univerſity, for *John Howell* Bookſeller. 1685.

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TO HIS Honoured Friend *WILLIAM LENTHALL* Eſq; of *Haſeley.*

SIR,

IT was not my Ambitious Deſign but the importunity, or rather Command, of ſeveral Gentlemen to commit to the Preſs theſe Experiments I had made on *Ilmington Waters*, that maketh me thus appear; however was reſolved it ſhould paſs as from an unknown Pen, until I found Concealment was impoſſible;and by abſconding ſhould ſeem to impoſe falſities on the World; which are the only Reaſons of my Name in Print. And ſeeing that hereby I do expoſe my ſelf to the Cenſure of all men,although it is but a mean Return for your Kindneſs and Civilities to me to entrench farther upon your good Nature; yet I hope you'l allow this following Treatiſe a propitious Acceptance,whoſe Prudence and Learning is able to withdraw me from the Calumny of mine Enemies. Although the greateſt Patron that ever liv'd was never able to protect Books from Cenſure, (neither is it reaſonable to impoſe Opinions in Philoſophy as Truths neceſſarily to be believed againſt the Arguings of more ſolid judgement) yet as a juſt Umpire may advance Truth againſt the malicious Cavils of them, that neither conſider the Sureneſs of the Experiments, nor whether the Deductions be a forced Conſequence or the Sence of Authors perverted, but through Envy quarrel at the Treatiſe becauſe Delivered by ſuch an Author. Flattery for Patronage I ſhall avoid, true praiſe being not more pleaſing to You, than Counterfeit is ungrateful, but ſhall preſume the more becauſe of your imbred proneneſs to the Advancement of Scholaſtick Undertakings. Neither ſhall I endeavour an Encomium of Him, whoſe Merits and Excellent Endowments have already become their own Herauld, beyond the Praiſe of

Your truly Affectionate
and Humble Servant

SAMUEL DERHAM.

THE PREFACE.

READER,

PErhaps it may ſeem ſtrange that I ſhould thus undertake an Hydrological Eſſay, ſeeing that many Eminent Writers have given their judgement of the Cauſe and Vertues of Mineral Waters, ſuch as Georgius Agricola, Libavius, Solinander, Andr. Baccius, Fallopius; *and of our own Countrymen Dr.* Jorden, Simpſon, Turner *and many others both Ancient and Modern Authors. Yet there were ſeveral Reaſons inducing me to publiſh this my Scrutiny into the Nature and Operation of this New-found Spring, by ſome called* Balmoore Waters *naming the Spring from the Place, which is near* Ilmington *a Town in* Warwick-ſhire. *This may alſo deſerve the Name of* Ilmington-Spaw *from its brackiſhneſs, according to* Van Helmonts's

Appellation Parad. 3 *and* 4 *of* Fontes aciduli, Spadanæ *or* Spaw-Waters. *Which name I ſhall retain in my following Treatiſe.*

My chief Inducements hereto, were

Firſt, The Common Good; ſeeing Multitudes dayly flocked to this Fountain, of whom many were poor illiterate Countrymen, that inconſiderately (without preparing their Bodies or Phyſitians adviſe) repairing hitherto might as well have haſtened to their ruine, as to recover their impared Health. For,

The moſt ingenious Dr. Cole *who firſt tryed and applauded theſe Waters by his recommending a Perſon of Quality to the Drinking of them, did ſo alarum the Ordinary ſort of People and the rude* Mobile, *as if Waters had been found with ſome Supernatural Vertue like the Pool of* Betheſda, *or the Waters of* Jordan *when they cured Leprous* Naaman *the Syrian.*

Secondly, The Doctor being called away by his Employment, I was deſired by ſeveral Gentlemen to commit the Tryals I had made on thoſe Waters to the Preſs; on no other deſign then to give Caution to the incautelous Multitude, among which many are (as *an* * Author *obſerved)* like ſo many Animals that follow one another and are apt to go the broader way, though it lead to ruine.

* *Auth. of the Query about Drinking the Bath-water prefixed to Dr.* Jorden *on the Bath.*

Thirdly, Ancient Authors did uſually take a general Survey of Mineral Waters, not deſcending to a ſtrict Scrutiny by Experiments into Particular Springs. Upon which account many things have been left falſe and imperfect, which an Examination of Particulars may deſcry ; and perhaps afford more of knowledge to Poſterity though in a few Experiments, than in great Volumes of Conjectural Philoſophy. As Dr. Tyſon *in his* Phocæna *Page* 9. *rightly ſaith*, ‘Malpighius *in his* Silk-worm ‘*hath done more then* Jonſton *in his whole* ‘*Book of* Inſects ; *and He and the ingeni*‘*ous* Dr. Crew *have taught us more of* ‘*Plants, than either* Gerard *or* Parkinſon.

Yet I deſire not to contemn, but to ſpeak with due honour and reverence of the writings of the Ancients to whom we owe great part of our knowledge, but withal hoping that I may have as much freedome to communicate my Sentiments, as others have done theirs before me.

As for the Calumny and Reproach which I ſhall occur from mine Enemies, and eſpecially thoſe that out of a Diſguſt to the Author verify the Proverb Try the Man and not the Cauſe, *I ſhall paſs by remembring the Saying*

-----Habent ſua fata libelli

But leaſt that by making uſe of ſome words mentioned by Helmont *and other Chymiſts, ſuch as* Archeus, Leſſas terræ, Acid *and* Alkali *&c. I ſhould ſeem far ſhort of anſwering my Deſign, I ſhall by the way hint out the Sence of them, leaſt that by obſcure Terms I ſhould ſeem to darken the Matter and amuſe the Reader, that is unacquainted with* Chymiſtry.

Helmont De Form. Ortu Sect. 61. *thus explaineth himſelf* Repetam ſeminum maſſam recipere in ſe corporalem Auram, vulcanum, Quem *Archeum* nomino. *Now the* Aura Vitalis *by him termed* Archeus, *is but that Stamp or Divine Impreſs made at firſt by God Almighty, to direct blind Matter in the Compoſition of an Object. For we cannot ſuppoſe that an* Embryo *is formed by a fortuitous concourſe of Atoms, and that Animals do propagate after*

after their kind by an accidental Conjunction of Matter; but the Divine Fiat *in the Creation made an over-ruling Power to the work of Generation and Specification of the Individual: whether it be called* Archeus, vis πλαστικὴ, Forma *&c. Which was at firſt made by God the Creator, and as* Helmont *elſe-where telleth us is as a* Faber *or Workman to the ſhaping of a Concrete in its Generation.*

Leſſas terræ *is that* Succus terræ fracidus unde ſurgit omne plantarum genus viſibili carens ſemine, ſataque ſemina promoventur in Deſtinationes. Helm. Imag. Ferm. Parag. 31. viz, *That fracid juice of the Earth, that is the Nutritive Juice to Vegetables. For Water on the Earth expoſed to heat and air will be ſoon endowed with a putrid Ferment, which is a* Leſſas *convertible by the* Archeus *into Vegetables.*

Salts are either Acid *or* Alkalizate, *upon the mixture of which contrary Salts an Effervescence will follow. So that an* Alkali *may be thus deſcribed. It is a fixed Salt which will make an Ebullition with an Acid, and by taking off the Edges of its*

Particles will ſweeten an Acid Liquor.

As for Mineral Waters, Libavius *giveth us this Notion* Quæ a ſimplici vulgari & mera diſcedentes, cum aliquo ſubterraneorum conſpirant, & aut ſpiritaliter ſunt tinctæ aut miſtæ corporaliter. Judicio Aquar. Lib. 1. Cap. 1. viz. *Waters that beſides their own Nature, have imbibed ſomething of the quality or ſubſtance of ſome Subterranean Mine. What are the* Subterranea *he afterwards telleth us* Lib. 1; *but* Gab. Fallopius De Therm. Aq. Cap. 8. *ranketh them under Five Heads.* viz. Vapours, Juices, Metals, Stones, *and* Earth.

As for Vapours impregnating Waters in their Current, I ſee no reaſon to make them a diſtinct Ingredient from the others, Fallopius *alloweth only Vapours to be found in Waters that are Poiſonous, Bituminous, and Sulphureous, yet of what kind ſoever, they ſeem not to differ from the Evaporating Object: as the Vapour of Water, is but Water rarified, whoſe Particles recollected in a Receiver may appear again under the form of Water. As* Helmont Parad. 2. *hath obſerved,* Vapor reipſa nil aliud eſt

Materialiter & formaliter, quam Atomorum Aquæ in altum ſublata Congeries. *To the ſame effect ſpeaketh* Libavius de Jud. Aq. Lib. 1. Cap. 6.

Dr. Jorden On Natur. Bath. and Min. Wat. Cap. 4. *not content with what* Fallopius *hath done, eſpecially becauſe New Minerals have lately been diſcovered (as* Calaem *in the Eaſt Indies,* Rhuſma *and* Terra Ghetta *in Turky* &c.) *and perhaps future Ages may diſcover many more) hath comprehended them under Seven Heads; taking a Mineral for* An inanimate Perfect Body bred in a Mine, in the Bowels of the Earth. *His* Genera *are* 1 Earth, 2 Stone, 3 Bitumen, 4 Salts or Concrete Juices, 5 Spirits, 6 Mean or half Metals, 7 Metals. *Of all which in as much as they cauſe Alterations in Waters, I ſhall take a ſhort Survey; Brevity here beeng intended.*

Firſt, Earth *is a cold dry ſluggiſh Body altogether effete in its vertue, except when it containeth ſome active Principle; ſuch as a Nitrous Salt by which Fullers-Earth doth ſcour Cloth, and Marle laid on Land* *doth cauſe Fertility; or an Aluminous Salt, ſuch as is found near* Scarbrough Spaw &c. *Upon which account the Chymiſts rightly call Simple Earth* Caput Mortuum *or* Terra damnata. *Water hereby may become turbid and muddy, but not impregnate with any Vertue.*

Secondly, Stones *by their Qualities of Cold, Dryneſs, and Stipticity come near that of Earth. Yea as Dr.* Jorden Cap.4. *hath hinted to us, Stones in their ſimple Nature diſtinct from any other Ingredient, are but as a* Caput Mortuum *and untamable by Fire or Water. 'Tis true ſome Stones will melt, others by Calcination turn as it were to Aſhes; but that is from a Heterogeneous Mixture of ſome Salt, Metal,* &c. *And this may be concluded hence, The more pure and free from Mixture Stones are, by ſo much the more indiſſolvable by Water or the devouring flames of Fire; as* Diamonds, Amiantus *or* Alumen plumoſum, Glymmer, Saxum Arenarium &c; *all which ſtony Concretions will endure the Fire: yea I ſuppoſe had we but a pure ſtony Body it would endure the waſhings of Water, and the*

the utmoſt degree of Fire. Pliny Natur. Hiſt. Lib. 36. Cap. 19. *ſaith* Amiantus lapis nihil igni deperdit. *Not only the* Terra Damnata *left after the Active Principles are drawn off in Diſtillation will endure the Fire; but the* Asbeſtum *which is an Efloreſcence of the* Amiantus, *and many ſuch like Stony Concretions (I doubt not) were they free from Heterogeneous Mixtures.*

Stones *then in their ſimple Nature yield no Vertue to Springs, except whilſt in their Primitive juices or* Solutis principiis; *for then they may cauſe an Alteration, as we may perceive by many cold petrifying Springs; of which almoſt infinite Examples might be produced here in our own Country. But when there is a mixture with a* Minera, *then* Stones *by Fire or Water may ſoon ſuffer a Diſſolution: as Marcaſites of* Iron, Copper, Alum, *&c. not only by fire may undergo a Change, but alſo may communicate their Vertue to Waters having a proper* Menſtruum.

Thirdly, Bitumina *are either hard as*

Amber, Carbofoſſilis; *or Liquid as* Petroleum *and* Naphtha. *We find by dayly Experience that unctuous Matter or Oyls will not undergo a perfect mixture with Water: yet by ſome Mineral juice may have its body ſo opened as to come floating with the Spring Water though in a confuſed Poſture. Yea ſaith* Fallopius de Aq. Therm. Cap. 8. *It is ſometimes ſo confuſed, that a Separation from the Water is very difficult. Inſtances of Bituminous Waters he giveth us; as the River* Lipparis *in* Cilicia, *which by its plenty will as it were anoint the Bodies of them that ſwim in it; the Fountains of Mount* Gibbus *near* Modena *in* Italy; *many Fountains likewiſe near* Baia *in* Campania; *ſo alſo Springs at the foot of* Veſuvius; *many alſo we read of in* Saxony, Swedland, *and at* Avergne *in* France; *and of one famous in our own Country at* Pitchford *in* Shropſhire; *and that Bitumen is the predominant Principle in our Springs at* Bath, *Dr.* Jorden *hath proved* De Nat. Bath & Min. Wat. Cap. 6.

Fourthly, Concrete Juices *called* Salts *which are not only found in Waters but being diſſolved make the Current Springs as ſo many Menſtruums to unlock the Bodies of other Minerals. The Species are uſually reckoned Four* viz. Alum, Vitriol, Nitre *and* Common Salt *(but as for the Number I ſhall not here diſpute) 'Tis true different Salts will ſhoot by Chryſtallization into ſeveral Forms, as* Vitriol *and* Alum *into* Glebas *(although theſe of Alum differ ſomething from them of Vitriol) Nitre into* Stirias *and* Salt *into* Teſſeras; *ſo likewiſe will other* Species *of Salt comprehended under theſe, by reaſon of their Glebes and difference of Particles. As for the Vertues of ſuch Springs we muſt look to the Nature of the Ingredients; and whether the Waters are not impregnated with ſeveral Mineras; from whence there muſt needs follow great Variety in Mineral Waters. That* Salt, Nitre, Alum, *and* Vitriol *are Ingredients of Mineral Waters, we have the Teſtimony of ſeveral Authors, too many here to relate. As Salt-Springs at* Saltzburgh *and* Halſtat, *and many other places in* Germany; *the Salt-Springs in* Tuſcany, *and as our Springs at* Droit-Wich *and* *at* Nant-Wich *will teſtify. Nitrous Springs we read of at* Caleſtria *in* Macedonia; *in many places of* Ægypt; *in many places in* France *mentioned by* Du Clos Claſſe Second and Third;*and Nitrous Springs by* Baccius De Therm. Lib. 5. Cap. 6. *Alum Springs are frequent in* Tuſcany *and many other Places of* Italy; *and alſo in* Germany, *and in* Spain; *with us at* Okenyate *in* Shrop-ſhire,*and that famous* Spaw *at* Scarbrough *in Tork-ſhire. Vitrioline Waters are alſo found (although the truth thereof is queſtioned by Dr.* Liſter De Font. Med. Angl. Cap. 7.) *Inſtances of which Dr.* Jorden de Nat. Ba. Cap. 7. *giveth us; as that at* Cyprus *deſcribed by* Galen *where the Water is Green, at* Smolnicium *in* Hungary, *in* Tranſilvania *&c, in which (ſaith he) the very Body of Vitriol is found. Beſides the Teſtimony of* Helmont Paradox. 4. *of* Pauhont *and* Savenir *two* German Spaws, *and the Experiments of Dr.* Simpſon *on our* Scarbrough Spaw; *and as I ſhall prove of* Ilmington Spaw. *As for the diſtinction of being vertually or by its quality contained I cannot allow of, not finding any ſolid Reaſon how*

how an Accident can be ſeperated from his Subſtance, and remain Exiſtent in another: for I look upon that Rule as true Accidens non migrat a Subjecto in Subjectum.

Fifthly, Spirits *(ſo called from their Volatility by fire) that enter the Compoſition of Metals will not endure fuſion by fire but eaſily fly off; ſuch as* Quickſilver, Auripigmentum, Sandaraca, Chriſcocolla, Cadmia *&c; which by ſome Authors are reckoned for Concrete Juices, but by others for* Spirits *from their Volatility: and Waters endowed with theſe kind of Ingredients are generally poiſonous.* Agricola Lib. 1. & 2. *telleth us of waters betwixt* Seburgh *and* Strapela *that by their Malignancy will kill Fiſhes, and other Animals that drink thereof. Arſenical Waters we read of, as at* Circum *in* Thracia, *at* Perant *near* Mompelier; *of many ſuch waters* Fallopius de Therm. Aq. *giveth us an account. Now Dr.* Jorden *reckoneth ſome Waters that contain Quickſilver for wholeſome waters, as that at* Serra Morena *and* La Nava *in* Spain, Almagra *and* Toletum. *But if we conſider how that* Mercury *is an*

Enemy to the Nervous Parts, eſpecially when unprepared; how it abounds with Arſenical Particles before it is purified, we may much doubt of the wholeſomeneſs of them, yet I ſhall not diſpute againſt the Poſſibility of the Thing. So alſo are theſe from Sulphur very dangerous, becauſe they often partake of a Poiſonous Minera.

Theſe that partake of Cadmia *are to be avoided, becauſe the Natural* Cadmia *is Poiſonous and a ſtrong Cauſtick.* Cadmiâ foſſili Aquæ infectæ acres eſſe conſueverunt, Agricol. de Natur. Eor. Efflu. ex Terra. Lib. 1.

Sixthly, Mean *or* half Metals,*ſo called becauſe they are fuſible but not malleable like Metals, as* Antimony, Biſmuthum *or Tin-Glaſs found in* England *and* Germany. *Theſe may be Ingredients to Mineral waters, and for the Vertues of ſuch we muſt look to the impregnating Object.*

Seventhly, Metals *as* Lead, Tin, Iron Gold, Copper, *and* Silver: *for* Mercury *from its Volatility by fire is reckoned by Dr.* Jorden *among Mineral* Spirits. *Theſe* *ſaith* Fallopius de Therm. Aq. Cap. 8. *May be Ingredients in Mineral waters, but telleth us, that he never knew any Particular Spring in which* Metals *had their ſhare.*

But we have ſufficient Teſtimony of Particular Springs that are impregnated with Metals. Baccius De Therm. Lib. 6. Cap. 3. *giveth us an account of ſeveral waters that have preyed on* Iron, *and ſeveral whoſe Vertue is from the* Magnet*(which indeed is a better ſort of Iron-ſtone)* Solinander De Font. Temperat. Cap. 6. *Inſtanceth divers Springs containing* Metalline *Ingredients, as that impregnated with* Copper *at* Baïa *in* Campania, *and that at* Luca *called St.* John's Bath; *with* Lead, *as the* Lead-Waters *in* Lotharingia; *with* Iron, *as at* Siena, Verona, *and* Luca. *To which I might add our Chalybeat waters at* Tunbridge, Aſtrap, *and* Scarbrough, *with our late found Spring at* Ilmington. *The ſame Author telleth us that waters are found impregnated with* Gold, Silver, Lead, *and* Precious Stones *although very rarely, becauſe of their Scarcity, and the compact Subſtances of Pearls.*

Multitude of Examples of Mineral waters we have cited by Dr. Jorden On Min. Wat. & Nat. Bat. Cap. 10. *to whom I may refer the Reader.*

But it may be queſtioned; how can Earth *be reckoned as a Mineral and one of the foregoing ſeven* Genera, *taking a* Mineral *for an* Inanimate perfect Body bred in the Bowels of the Earth? Anſw. *Minerals are here taken in a large ſenſe, under which* Earth *is comprehended in as much as it is the Receptacle and* Matrix *of Subterraneous Concretes, whoſe Particles may alſo be communicated to water in its Current*; Stones *alſo in this reſpect may be taken for Minerals.*

Concrete Juices *or* Salts *are reckoned as a Diſtinct* Genus *(although as I ſhall hereafter prove, that all Compound Bodies in the Animal, Vegetable, and Mineral Kingdome are made out of a* Succus *as their more immediate Matter) from their Properties reſulting from their peculiar texture of Parts. Thus* Salts *are reckoned from their eaſy Diſſolution in water, and their reconcretion.* Bitumina *from their burning and waſting by fire, although they enter* *not the Compoſition of a Metal.* Sulphur *will burn and waſt by fire, and is alſo often a Metalline Ingredient ; and is reckoned with* Mercury *&c. among* Mineral Spirits, *which are ſo called from their Volatility by fire although they enter the Compoſition of Metals.* Antimony *and* Tin Glaſs *are accounted as half Metals, becauſe they are fuſible, but not malleable like Metals ; which are both Fuſible and Malleable Mineral Subſtances.*

I need not Apologize for the Uſefulneſs of Mineral Waters, ſeeing they have been for ſeveral Hundreds of years in great Eſtimation. The Romans *we are informed by* Baccius De Therm. *had their Baths in great requeſt, and for the greater ſplendor had many Magnificent Buildings erected at* Rome. *And of the frequent Bathings of the Turks, although only with pure Water* Alpinus De Medic. Ægypt. Lib. 3. Cap. 17. *giveth us an Account.*

I need not likewiſe relate the Superſtition of the Ancients ; who, when a Mineral Spring was found, from the ſtrangeneſs of its Effects ſoon dedicated it to ſome Saint *or* Deity, *becauſe they made little Scrutiny* *into the Nature of Mineral Waters. And ſince that Experimental Philoſophy hath found favour in the world, knowledge herein hath dayly encreaſed; and for the Promotion hereof, let us make enquiry into each Particular, that at length we may arrive to Univerſal Concluſions.*

In the Proſecution of my Deſign I ſhall obſerve this method, and accordingly divide the following Treatiſe.

Firſt, To enquire into the Nature of Compound Bodies either in the Animal, Vegetable or Mineral Kingdom; under Minerals will fall in a Conſideration of the Original and Difference of Glebes, that chiefly give Eſſence to Mineral-Waters.

Secondly, To make Experimental Eſſays into the Nature of Ilmington-Spring.

Thirdly, After taking a ſhort Survey of moſt Diſeaſes incident to the Body of man, as to their Cauſes or Original; to enquire how far Ilmington-Spaw *may* *conduce to their Cure, and to preſerve Health whilſt entire.*

But by the way take notice, That whereas I made the Experiments on Ilmington-Spaw *in a dry Seaſon, and was very careful and exact in the weight of the water which I have given Pag.* 48; *it may admit of a Variation not only in weight, but be weakned in its Vertue in a wet Seaſon when the Springs are rank by a mixture of Rain-water; and alſo by the breaking in of any freſh Spring.*

Hydrologia Philoſophica

OR

An Account of

ILMINGTON WATERS, &c.

HAVING Obſerved with * *Paracelſus* that proof by Authority, where Reaſon and Experience are deficient, is altogether uncertain; and that *Philoſophy* is not to be founded on *Phanſy*, but on Experience and plain Natural Diductions therefrom: I ſhall in this following Treatiſe lay down only ſuch Poſitions, that I find built on Experience. For if bare Authority might paſs for Proof, I might cite *Anaxagoras* to prove the Snow black, and ſuch like ſtrange ſpeculations, which to the judicious will ſeem only as ſuch. Yet I ſhall not contemn Authority, but yeild due honour and Reverence to our Anceſtors, whoſe Works ſtill are for our Inſtruction; but ſhall chiefly inſiſt in the footſteps of them, that have made Experimental Eſſayes for their guid.

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* *Probatio ea nauci & nihili eſt, quâ per alios nimirum Galenum, Avicennam, Rhaſin &c. noſtra tuemur & velamus Paracel. L. 4. de Orig. Morb. Matricis.*

In the proſecution of my deſign, I ſhall ſpeak ſomewhat as to the Principles of Concretes, which will lead me on to a conſideration of Mineral Glebes, that principally give Eſſence to *Spaw-waters*.

Divers have been the opinions of Philoſophers about the Elements of Compound bodies; not to mention the Opiniō of *Heraclitus*, who obſerving *Fire* to be an active ſimple tenuious body, made it the firſt Principle of all things; nor the opinion of *Heſiod*, aſſigning *Earth* for the Original of Compounds, there are other more famous, which Sects of Philoſophers do ſtill maintain. Such as that 1ſt, of the *Ariſtotelians*; 2ly, of the *Chymiſts*; 3ly, of *Thales Mileſius*, *Helmont* and others; 4ly of *Epicurus* and *Democritus*.

1. The *Ariſtotelians* place the foundation of Bodies in the four Elements (*viz*) *Fire*, *Air*, *Water*, and *Earth*. Which I wonder at, ſeeing *Ariſtotle lib*. 2. *de gener. cap*. 8. alloweth of, and urgeth that Argument. *Bodies conſiſt of ſuch Principles into which they are ultimately reducible.* But by all the Analyſis that either Art or Nature could make, did never find *Fire* an

ingredient. To talk of an Element of Fire *ſub Concavo Lunæ*, is but a ſuppoſition without a Demonſtration. The *Air* we know is neceſſary, and that in ſeveral reſpects, to the Continuance, and Preſervation of our lives, but no Demonſtration of its firſt being an Element. The Quaternary of Elements is ſo far from ſolving the Phenomena, of the more abſtruſe Receſſes of Nature; that it is all one as D^{r} *Willis de Ferm. c.* 1. *p.* 3. hath rightly obſerved, to ſay a Houſe is made of wood and ſtones, as to ſay a Body is made of the Four Elements. For it is hard to imagine ſuch Things to be Principles, which neither anſwer the Phænomena of Nature, nor the Reduction of Concretes, and truly the ſuppoſing Such for Elements, will be but an Imaginary Philoſophy.

2^{ly}. The *Chymical* Principles are, *Salt*, *Sulphur*, and *Mercury*, becauſe in an Analyſis of Bodies by Fire, theſe Three appear; whether the Concrete belong to the Animal, Vegetable, or Mineral kingdom. By Reduction of a Metal or Mineral (as the Chymiſts thought) into its firſt Elements, they extract a Sulphur or Oyl, a Fluid which in Minerals is a plain Mercury or Quickſilver, and a Salt. Out of Vegetables and Animals, they extract an Oyl or Sulphureous Spirit, which is but an Eſſential Oyl gotten by Fermentation, a Salt, and Mercury; which laſt is but the Phlegm or Water, whoſe Particles are driven off by the ſtreſs of Fire, and recollected in a Receiver.

But the ingenious D^r *Willis de Fermen. c.* 2. obſerving a *fæces* left after Diſtillation, and when the other Principles are drawn off to be quite uſeleſs, yea void of Mutation and Exaltation, and therefore properly called *Caput Mortuum*, or *Terra Damnata.* Beſides, he conſidering that there muſt be ſome ſubtile ſpirituous Agent, to bring Things to maturity and perfection, as in the growth and fermentation of Vegetables and their fruit; that by the Depreſſion of this Active Principle, Things are crude and immature, and by the decay thereof decline and die. That Heat, Conſiſtence, variety of Colours, and Taſts; yea the amiable texture of Parts do chiefly depend on a Sulphur. That the Weight, Solidity, and Duration of Bodys without Putrefaction do depend on a Salt, which detaineth and fixeth the Volatile Parts and Sulphur. That Water is a convenient Vehicle for the moſt active Principles, and to aſſociate them to the Salt. Upon ſuch like conſiderations hath multiplied the Chymical Principles into Five, *Spiritus*, *Sal*, *Sulphur*, *Aqua & Terra.*

Againſt which multiplication I ſhall propoſe theſe Experimental Obſervations, proving *Spiritus* to be no diſtinct Principle from the three former, *viz. Salt, Sulphur and Mercury*: beſides what may be ſaid to his fifth Principle *Earth.*

All ſorts of Chymical Spirits are reduceable to two kinds, *Sulphureous* and *Saline*; of Saline Spirits there are two ſorts, *Volatile Alkalizate* and *Acid*.

Sulphureous Spirits, ſuch as Spirits of Wine, Roſemary, Juniper; and all Sulphureous Spirits got by fermentation out of Vegetables, are nothing but an eſſential Oyl or Sulphur exalted with a little Phlegm and Salt. This is evident from its Inflammability, which is allowed on all ſides to depend chiefly on the Sulphur.

Take Spirit of Wine or Brandy a Spoonful, it will take flame by a burning Paper or Candle, which will continue until all is conſumed, except an inſipid Water or Phlegm: and the beſt way of trying the goodneſs of Vinous Spirits, is by inflammability; which prove better or worſe, according as they burn away more or leſs. Some Chymiſts aſſert, they have had ſuch highly rectified Spirits of Wine, that by burning would totally conſume away, that the flame would like the containing Veſſel dry, leaving neither Fæces nor Phlegm. What difference is there betwixt Sulphur, and Sulphureous Spirits; excepting Fermentation and Diſtillation, by which the ſubtile parts are ſeparated from the more feculent, but not in an ordinary Sulphureous Body, ſeeing both take flame and burn alike? T'is true, by Diſtillation the more refine parts are ſeparated, and the Sulphureous carry with them ſome Phlegm, and a little Volatile Salt: but that deſtroyeth not the Sulphureous parts as ſuch, which being the predominant Principle, give denomination to the Liquor, and differ not as to the Principle of Sulphur.

Volatile Saline Spirits, as Spirit of Harts-horn, Spirits of Sal Armoniac; and all Spirits drawn from Animals, as Spirit of Vipers *&c.* conſiſt of a volatile Salt diſſolved in a little Phlegm, with a very ſmall quantity of Sulphur. And that it dependeth on a Volatile Salt diſſolved in Phlegm, is thus Apparent. Fill a ſmall Vial with good Spirit of Harts-horn, Sal-Armoniac, *&c.* let it ſtand without moving for about half a year, you'l find a Phlegm inſtead of a Spirit, but the Salt all ſhot or Chryſtallized to the ſides of the bottle; which Salt being diſſolved in freſh Phlegm, will become again Spirit of Harts-horn. Beſides you may make Spirit of Harts-horn thus, yea as good as the ſhops will afford. Take of the Volatile Salt ſhot in the Neck, or to the ſides of the Receiver in the Diſtillation of Harts-horn; mix it with ſo much Phlegm drawn off, as ſufficeth for its diſſolution; you'l have an excellent Spirit, which according to the Quantity of Salt diſſolved will be ſtronger or weaker. So that the Phlegm riſing with volatile Salt in Diſtillation, or afterwards mixed with it; liquifieth and turneth it into a Spirit. The ſame may be ſaid of the Spirits of all Animals, and is manifeſtly apparent by the Diſtillation of Vipers, whoſe Salt ſticketh for the greateſt part to the ſides of the *Receiver*, or head of the *Limbeck*, but mixed with the Phlegm doth become a Spirit of Excellent Uſe.

This Salt in Diſtillation carrieth with it a little yellowiſh Oyl, but by inſtillation of *Sp. Vini Tartarizatus* is preſerved, except the Spirit of Wine containeth a conſiderable quantity of Phlegm, which will ſoon diſſolve the Volatile Salt of Vipers.

Acid Spirits, as of *Vitriol*, *Vinegar*, *Sulphur &c.* is but an Eſſential acid Salt liquified by Phlegm, or by Violence of Fire. Spirit of Vitriol is Salt Liquified by force of Fire, which hath freed the Saline from the terreſtrious parts; this we may conclude from the Cauſtick quality both of the Spirit and Oyl; which only differ, in as much as the Oyl is the more Acid part of Vitriol with a little Phlegm and Sulphur and improperly called Oyl, but the Spirit with more Phlegm and leſs of the Acid Part. And that *Spirit* of *Vitriol* chiefly conſiſts of a Salt *in fluore*, is more fully manifeſt by inſtillation of an *Alkali*, for Example; pour *Oleum Tartari per Deliquium*, upon Spirit of Vitriol, as in the making of *Tartarum Vitriolatum*, the Acid of Vitriol and Alkali of Tartar combine together into a Neutral Salt, but the Phlegmatick part is evaporated as an inſipid Water.

So may any Acid Salts *in fluore*, being mixed with Alkalis be revived again into dry Salts, by Evaporation, Precipitation, Chryſtallization &c. ſo that Saline Spirits either Acid or Alkalizate, in as much as they contain a Salt highly exalted or volatiliſed, are called *Spirits*, *Sal quatenus volatile Spiritus dici poteſt. Helm. Paradox.* 4.

Againſt this Opinion *Thales Mileſius*, *Helmont* and others oppoſe themſelves. *Thales* obſerving Vegetables to grow and flouriſh by *Moiſture*, that Plants fade by drougth and Trees caſt their leaves, but after ſhowrs of Rain revive, look freſh and green; that *Moiſture* is requiſite to Nutrition of Animals, that Minerals take their Original and encreaſe from a concretion of their proper *Succus*, that Stones take their Riſe from a petrifying juice: upon ſuch like Conſiderations hath aſſigned Water for the Original of Concretes. To which Principle *Van. Helmont* hath added *Semen*; making the Chymical Principles *Salt*, *Sulphur*, and *Mercury*, but poſterior products of *Water* and *Seed*. He telleth us indeed, *Primordialiter duo tantum in Univerſo eſſe Elementa aerem videlicet & aquam, à Textu ſacro ſatis inſinuata, per ſpiritum in mundi incunabulis aquarum abyſſo ſupernatantem Paxad.* 2. But then ſpeaking of the Elements as the firſt matter of Compounds, telleth us by his own experience, he could convert all Concrete bodys into Water, as into the only and firſt Principle. And if ſo, what becomes of *Earth* the Fourth *Ariſtotelian* Principle, and the Fifth *Chymical*, according to Dr *Willis?* *Noſtra Mechanica mihi patefecit, arenam, marcaſitam, argillam, terram, lapides coctos; vitrum, calcem, ſulphur, &c. tranſmutari in ſalem actualem æquiponderantem ſuo corpori, unde factus eſt; & quòd iſte ſal aliquoties cohobatus cum ſale Circulato* Paracelſi, *ſuam omnino fixitatem amittat, tandem tranſmutetur in liquorem, qui etiam tandem tranſit in Aquam inſipidam, & quòd Aqua iſta æquiponderet ſali ſuo unde manavit. Plantam verò, carnes, oſſa, piſces, & quicquid ſimilium eſt, novi redigere in mera ſua Tria, unde poſtmodum aquam inſipidam confeci.* Helm. *in Elementa.* So that by his *Alkaheſt*, at leaſt aſſiſted with *Paracelſus's Sal circulatam* he could reduce all Concrets into Water, yea the *Tria Chymicorum Principia*, whence we may ſuppoſe them but ſecundary things made out of Water, by the efficacy of Seminal Principles planted *ab origine.* *Lantent in Elementorum condo ac ditiſſimo promptuario, hoſpitatæ ab initio rationes in ævum durabiles, ſcientiâ rerum ſibi in tempore futurarum inſtructæ*, &c. Hælmont *Parad.* 1. So that he granteth but Two firſt Principles (*viz.*) *Water* for the ſubject matter, and *Semen* for the efficient and plaſtick cauſe. From this experiment we muſt neceſſarily conclude (allowing the truth thereof) That the *Quaternary* of the *Ariſtotelian* principles, and alſo the *Tria* (for Spirits

and

and Earth are but products of the other) of the Chymiſts muſt fall, excepting that of Water with the Seminal Principles, for we muſt allow that argument of the *Ariſtotelians*; into which bodies are ultimately reſolved, of ſuch they do conſiſt; but into the Principle Water bodies are ultimately reſolved, *Ergo*, They conſiſt of the Principle of Water. For the truth of which Analyſis, we have the experience of that profound and learned *Helmont*, who with his *Alkaheſt* could reduce Animals, Vegetables, and Minerals into a pure water: only telleth us, that the greateſt difficulty was in the Reduction of the *Sabulum bulliens* or *Quellem*, yet by induſtry the thing was fecible. *Paracelſus* his Predeceſſor did arrive almoſt to that height, who could with his *Circulatum majus* reſolve Metals into an Oyl, which *Helmont* by the addition of an Alkali did change into water. Beſides the teſtimony of *Helmont*, led (as he tells us) by thirty years experience, and not truſting to probable conjectures, *Lullius* and others have contended for the ſame thing, and pretended to have been experienced in the ſame grand and noble Menſtruum. But to lay aſide Authority, Reaſon built upon Experience ſeemeth to conclude that *Water* is the main (and perhaps I might truly ſay the only ſubject matter of Concretes. Which by the Seminal Principles and ferments thereof is tranſmuted into this or that Bodie,according to the nature or ſpecies of the *Semen* or *Idea* of the *Archeus*. It may perhaps ſeem a ſtrang Paradox, and a renovation of an old Philoſophical Hypotheſis exploded by moſt of the Ancient and Modern Naturaliſts; But were it not beyond my intended ſubject, I might proſecute the aſſertion and prove, That all bodies in the Animal, Vegetable, and Mineral kingdom do take their material Principle from Water. I mean not that all ſublunary bodies do immediately owe their Original to a pure elementary Water; but either to ſimple Water, or elſe to a *Succus ſui generis nutritius*, which is matter run through ſome alterations from that firſt pure Element of Water. And in this ſenſe are the Aſſertions of the *Hydroplaſticks*, comprehending *Succus* under the notion of Water. I might only propoſe, Let any man ſhew me an Animal, Vegetable, or Mineral that I cannot prove to owe its Original immediately to Water, or to a Succus transformed by the Seminal principle into the propoſed Object. But ſhall only inſtance ſome particulars, leaving a further proſecution to another's enquiry.

Dr. *Sharrock* giveth us a Catalogue of Plants that would grow and encreaſe by ſimple water in a Glaſs-bottle; as Mints, Sedum multifidum, Pennyroyal, Bugle, Prunella, Water-creſſe, Scordium, Marſh-mallows, Nummularia, *&c.* '*Sedum multifidum* in a month en'creaſed in weight half a Scruple, *Scordium* ‘as much in a fortnight, *Dorias* his Woundwort in ſix weeks *gr.* 13. *Bugula* in leſs time *gr.* 15. *Water-creſs* in a month *gr.* 25. *Ranunculus* in 6 weeks half a Scruple, *Periwincle* as much, *Prunella*, *Brooklime* and moſt of the ſorts of *Mint* got weight proportionably. *Shar. Veget. p.* 102.

For experiment ſake I took ſeveral ſmall young ſlips of Mint diligently weighed, which I kept in Glaſſe-bottles of fair water the ſpace of Twelve weeks, as the water waſted I poured on freſh, at the end of which time I weighed each Plant (for every Slip was now become a Plant with large roots and branches) and found the former weight of ſeveral of them to be tripled, but the leaſt of them doubled.

Famous are the Experiments of Mr. *Boyle.* ‘I cauſed (ſaid he) my Gardiner to dig out a convenient quantity of good Earth and dry it well in an Oven, to weigh it, to put it in an Earthen Pot almoſt level with the ſurface of the ground, and to ſet in it a ſelected ſeed, he had from me of Squaſh, which is an *Indian* kind of Pompion, which grows apace; this Seed I ordered him to water only with Rain or Spring water *&c.* and a little after giveth us the account of it from his Gardiner. ‘I have weighed the Pompion with the Stalk and Leaves, all which weighed Three Pound wanting a quarter; then I took the Earth, baked it as formerly, and 'found it juſt as much as I did as firſt, which 'made me think I had not dryed it ſufficiently, then I put it into the Oven twice 'more, after the Bread was drawn, and 'weighed it the ſecond time, but found it 'ſhrink little or nothing. *Boyle* Scep. *Chy.*

He giveth us alſo another Experiment from the ſame Gardiner in theſe words. 'To give 'you an account of your Cucumbers, I have 'gained two indifferent fair ones, the weight 'of them is Ten pounds and a half, the branches and the roots weigh'd Four pounds 'wanting two Ounces; and when I had weigh'd 'them I took the Earth and baked it in ſeveral ſmall earthen Diſhes in an Oven: and 'when I had ſo done I found the Earth wanted a pound and half of what it was formerly, yet I was not ſatisfied, doubting the 'earth was not dry: I put it into an Oven the 'ſecond time (after the Bread was drawn) after I had taken it out and weighed it, I found 'it to be the ſame weight. So I ſuppoſe there 'was no moiſture left in the earth. Neither 'do I think that the Pound and half that was 'wanting was drawn away by the Cucumber, 'but a great part of it in the ordering was in 'duſt (and the like) waſted.

Famous is alſo that Experiment of *Helmont*: Who took of earth dryed in an Oven 200 pound, put it in an earthen veſſel, and moiſtened it with rain-water, and planted in it a

Willow tree of Five pounds weight; this he kept and watered with rain, or diſtilled water, to prevent an addition of freſh earth, he covered the veſſel with a plate of Tin full of holes At the end of Five years he dug up and weighed the Tree, and found the Tree, computed with the leaves fallen off in four Autumns, to weigh 169 Pounds, and about three Ounces, and the Earth in which it was ſet to want only about two Ounces, ſo that 164 pounds and upwards was the encreaſe by *Water.*

Had this Tree, or other Plants encreaſed by ſimple water been diſtilled, undoubtedly there had been found the ſame principles with others of the ſame Species that ſprung in open Gardens or Fields. *Water* we ſee by theſe Experiments was diſguiſed by the Plaſtick virtue of the Seeds into various formes; as it is evident by the Experiments of Mr. *Boyle.* ‘One
‘of the Vegetables cheriſhed only by water,
‘having obtained a competent growth, I did
‘for tryal ſake cauſe to be diſtilled in a ſmall
‘Retort, and thereby obtained ſome Phlegm,
‘a little Empyreumatical Spirit, a ſmall quanti-
‘ty of aduſt Oyl, and a *Caput mortuum*, which
‘appeared to be a Coal, I concluded it to
‘conſiſt of Salt and Earth. And a little after.
‘The water I uſed to nouriſh this Plant
‘was not ſhifted or renewed, I choſe Spring
‘water rather than rain-water, because the
‘latter is a kind of *πανσπερμία*, containing
ſteams

'ſteams of ſeveral bodies wandring in the 'Air, and a certain ſpirituous ſubſtance, *&c.* *Scept Chym. p.* 112. Here are the Chymical Principles extracted from a Subject, whoſe matter before tranſmutation was Water.

That Water is the material Principle for the growth and encreaſe of Vegetables, may be collected from theſe obſervations. *viz.* Rain-water or Dews refreſh the fading Herbs; That flooding of grounds cauſeth fertility, That Graſs cut down by the want of a ſupplemetal *Succus* ſoon withereth; That exceeding Droughts have cauſed Famines; and that the Corn of *Ægypt* dependeth on the overflowing of *Nile.* And truly whence is the luſtre of the Fields bedecked with flowers, but from Water transformed into this or that Species, according to the *Idea* of the *ſemen*, or *Archeus*; for according to the Plaſtick or Formative power, Water is changed into roots, ſtalks, leaves, yea to make the glorious Lilly.

As Vegetables, ſo Animals receive their growth and ſuſtenance immediately from Water, or elſe mediately *viz.* From Herbs, Fleſh, *&c.* which is but Water metamorphized, and run through former alterations. An Ox feedeth on graſs or plants, *viz.* Water transformed thereto, a Man feedeth on the fleſh of the Ox, whoſe material Principle is but Water transformed into a Plant, thence into Fleſh by divers fermentative alterations of the Ox, and now farther according to the ferments of Man.

But to ſhew more particularly, how that *Water* or at leaſt a *ſuccus* is neceſſarily requiſite to the nutrition of every Animal; Aliment taken into the ſtomach, before it is fit for nutrition is turned into Chyle, (which is a Succus) from whence blood, then Chyme, to be aſſimilated into each part. As for example, Bread or Fleſh eaten by a man, is by concoction turned into a fluid Chyle, by the ferment in ſanguification, the Saline and Sulphureous parts work upon each other, and turn the Chyle into Blood; out of which a *ſuccus* is ſeparated, and by the innate ferment of each part aſſimilated thereto. What is Fleſh but a *Leſſas* or watery *ſuccus* firſt turned into Graſs, Corn, *&c.* and at length by ſucceeding alterations by ferments ſhaped into Fleſh. And the more probable it is, ſeeing that the Fleſh, Blood, Urine or Milk of Animals by bare diſtillation is turned for the greateſt part into Phlegm. The fleſh of Eeles (as Mr. *Boyle* hath obſerved) by diſtillation doth yield a great quantity of water, and whilſt diſtilling they ſeem to boyl like a pot of water, ſeeming to be nothing elſe but a congealed water.

The *ſemen* of Vegetables before roots and branches are formed do require a moiſt body, which according to the Plaſtick power of the *Archeus*, doth *Proteus* like turn its ſhape, and that which was in the form of Water is turned into a Vegetable, which by the Ferments of our body may become blood or fleſh, which at length by Putrefaction may be reſolved and turned in Worms *&c.* But even to the generation of Worms and Inſects a putrid juice is required.

If we look to the firſt formation of an Animal, we ſhall find the *Sperme* to be but a Liquor diſguiſed by the Ferment of Seminal Veſſels; which by circulation through the parts of the body whilſt blood, is impregnated with an Efflореſcence of the whole. And when it is thus prepared, before the *Aura vitalis* can exert its operation, it muſt have a convenient Matrix as a place, but an Addition of moiſture for encreaſe of the Animal formed.

As Vegetables and Animals have their Seeds, ſo likewiſe Minerals in the Bowels of the Earth; and not only to the encreaſe, but alſo to the firſt formation of a Particular in either of theſe *Species*, we ſtill find a *Succus* required. 'Tis true the Mineral Seeds are inconſpicuous and fall not under our ſenſe of *Seeing*. So by an exact enquiry we ſhall find theſe of Animals and Vegetables. For the prolifick part, or *Genitura* is properly the *Seed*; but the Sperme in an Animal, and the

Grains

Grains or Corns among Vegetables, are but convenient Receptacles to lodge the more active part; (which is indiſcernable by the beſt inſtruments in Opticks) until ſet at work by ſome External cauſe, in its proper place. But however we ſee by dayly experience, that by the plaſtick power of the Seeds, a juice is formed into roots and branches: ſo from Metaline and Mineral Seeds placed in the body of the earth, rather in divers parcels thereof *ab origine*; whence the variety of Mineral Glebes, which turn a *Succus* into their own nature. Theſe Mineral Principles being ſet at work by the Celeſtial influence upon appropriate matter, form to themſelves a Mercurial Juice and Sulphur, as the more immediate matter to the production of Metals or Minerals, which by the ſpecifick Ferments of the Seeds at length are compleated.

That Mineral Glebes will appropriate a juice, and therefrom perfect a Metal is hence evident. As Earth out of which Nitre is extracted, and afterwards expoſed to the open Air will centre upon it the floating Saline Particles; the like effect we ſhall find upon the *Caput mortuum* of Vitriol, ſo as to be again impregnate with a freſh Vitriol or Nitre; in like manner Mineral Glebes after the Metal is extracted, will again convert a *Succus* into a Metal: as the Miners of Tin, Lead, *&c.* can teſtify, who find a freſh Ore where All was for ſixty or ſeventy years before extracted ed. Dr. *Jorden* hath obſerved, that the Tinners in *Cornwall* within thirty years have found Tin generated *de Novo*, where it hath been all digged up, and the place filled with earth. *Jord. Natur. Bath. Cap. XI.* Many examples he citeth, as the great Income witneſſed by *Fallopius*, that the Duke of *Florence* hath by Metals and Minerals produced where all Ore was before exhauſted. So alſo that of the Iron Mines at *Ilva* an Iſland of the *Adriatick* Sea, where the *Venetians* find Iron generated afreſh, yea as faſt as they can work it; this is teſtified by *Georgius Agricola. de Ortu & Cauſ. Subt. Lib.* 5. *p.* 61. Who farther confirmeth the Reproduction of Metals, *Putei ex quibus materia metallo gravida eſt effoſſa, aliquot annis eadem replentur.* And a little after; *In Lygiis ad Sagam oppidum eruitur è pratis ferri vena, quæ foſſæ decennio replentur venâ renatâ. Agric. Lib.* 5. *p* 64. Remarkable alſo is that of *Eraſtus. Vidi ego argentum puriſſimum in valle Joachimicâ, in arbore ſive trabe cuniculi cujuſdam concretum, quæ vix ante annos* 25 *aut* 30 *ad ſuſtinendum cuniculum ibi collocata fuerat. Eraſtus de Medicin. Nov. Paracelſ. de Metallis p.* 19. That in the Mines of S. *Joachims* Valley, Silver was generated on a Prop of Wood, that had not above 25 or 30 years ſupported the Mine-works.

We cannot ſuppoſe the reaſon of the new Eruptions of fire after hundreds of years at *Ætna* and *Veſuvius*, and theſe prodigious

burn-

burnings of the Mountains *Popochampeche* and *Popocatepec* mentioned by Mr. *Gage* in his *Survey of the Weſt Ind. Cap.* 13. Except a production of Bituminous or Sulphureous matter generated *de Novo* is the cauſe of perpetuating theſe Vulcano's. For elſe how could the fire burn round theſe Hills, and perhaps return violently to the ſame place it had burned in about a hundred years before. It muſt certainly find new matter, ſeeing that in former Eruptions of fire Aſhes have been caſt forth, yea the very ſtones and earth have been as it were calcined to Powder. So that we cannot imagine Sulphureous matter to be there left, but by the Seminal Principles and a convenient *Succus* to be newly begotten. But I need not proceed to produce the teſtimony of more Authors, as I might out of *Cæſalpinus de Metallis*, and *Libavius* in his *Alchem. de Metal.* ſeeing moſt Authors as to this particular have allowed a generation of Minerals *de Novo*, not approving the Opinion of ſome few, ſuppoſing them to have been latent from the Creation. The difference is whether with *Eraſtus* in defence of *Ariſtotle* we ſuppoſe the matter (before concretion into a hard Mineral or Metalline Subſtance) to be a *Vapor*, or with *Agricola* we believe *Succus eſt ex quo formatur Metallum de Ortu Subt. Lib.* 5. *p.* 71. but it will not be very material. For if the Matter do arrive to the Mineral Glebes under the form of *Halitus* or

Vapor; What is *Vapor* but a *Succus* or moiſt body, whoſe Particles are ſeperated and elevated apart, but may be collected again into a greater Bulk by a Receiver, *&c.* as *Helmont* hath ſufficiently proved? In Diſtillation of Water the vapour that ariſeth is but Water rarified, whoſe Particles collected in a Receiver make up again a body of Water.

That Minerals may be made out of Water, we have that Experiment cited by Mr. *Boyle* out of *Monſieur de Rochas*. 'I took (ſaith he) water which I well knew not to be compounded nor mixed with any other thing then the 'Spirit of Life. By a well proportioned artificial heat I ſo ordered it, that with it 'and coagulations, congelation and fixation 'I turned it into earth, which earth produced Animals Vegetables and Minerals. Here Water was turned into Earth which at length was converted into either of the Three States.

Out of Mercury ſaith the afore-cited Author, a fourth or fifth part of Water may be obtained without any addition, which for ought he could find, could not be reduced to Mercury; ſo that it appeared to be plain Water.

As for that Objection; why Metals ſhould weigh heavier than water, or that a Spoonful of Quickſilver is in proportion nigh fourteen to one, if Metals ſhould be made out of, or elſe Water diſguiſed? This I ſay doth depend on the Seminal Principles collecting more matter

ter in leſs ſpace in ſome bodies then in others. Bodies which have few Pores or Interſtices of parts, but Particles of matter cloſely united, ſo they are more heavy or light, although the ſame Elementary matter compoſe all, but not compact in all bodies alike. And the inſpection through a Microſcope on the Pores of bodies will clear up this anſwer to the Objection.

The firſt Change of Water in order to Metals is into a Mineral Mercury,the next change by coagulation with Sulphur is into ſome metal, according to the Specification of the Seed, the repurgation from Sordes or feculent matter, and the tincture of the Sulphur either Solar, Lunar, Saturnine, *&c.* ſo the diverſity of Metals ariſe.

Although the foregoing Experiments prove the more immediate matter of Generation and Nutrition to be Water, yet they do in effect prove one material Principle which is the ultimate Reſult of Water and all other Bodies; as by the Experiment of *Monſieur de Rochas*, and by Converſion of water into the roots and branches of Vegetables may be collected. For as *Helmont* by his *alkaheſt* could convert Stones, Earth, Glaſs, yea any body into water; ſo water may again be tranſmuted into fixed matter. As it is proved by the encreaſe of Mints or other Vegetables in water; by *Helmont*'s Experiment before cited of a Willow Tree; by Mr. *Boyle*'s Experiment of a Squaſh, in which water is transformed into a body according to the nature of the thing nouriſhed. Yea in the Animal, Vegetable and Mineral Kingdome, as the Aliment is converted into a *Succus*, or at leaſt is a ſucculent matter before Nutrition; ſo the *Succus* is again converted into fleſh, bones, roots, branches, leaves, or metalline Concrete, according to the individual and its parts of this or the other Species. So that it may be as well urged; That fixed matter is the firſt Element of all things, as well as Water. For as all Concretes may be converted into Water, ſo Water may be converted into fixed matter. As for Inſtance, Vegetables that from a watery nouriſhment are become a groſs and hard aliment taken into the ſtomach of an Animal is by the ferment thereof turned into a liquid Chyle, which by the ferment of the Heart, *&c.* is turned into a balſamick blood, and from thence again into bones, fleſh, or other groſs and fixed Subſtances.

From the tranſmutations and reductions of Matter into its priſtine form, may be concluded the truth of the Fourth Opinion, *viz.* of *Epicurus*, and *Democritus*. That *Matter* is the firſt and only Principle, out of which all concrete bodies are made. And according to the divers figurations, motions, and fixation of the Atoms or minute parts of matter, ſo are bodies of this or that Species. I cannot cloſe with the opinion of ſome, that to matter would add *Chance* for a Principle; as if the glorious bodies of the Sun, Moon, Stars, *&c.* were made by Chance, or by an accidental collection of Atoms, as if a Dog or other Animal were but as a Clock, or other mechanical Engine: but that Matter was ſhaped at firſt by the Divine *Fiat*, and is now metamorphized according to the Plaſtick power of the *Archeus*, or Seminal Principles planted *ab origine* by God Almighty; which by the Celeſtial influences are ſet at work, and out of convenient matter form to themſelves a Body. We muſt not rely on Secondary Cauſes to explain all the ſecrets of Nature, as Mr. *Boyle* in his *Uſefuln. of Experim. Phil.Eſſay* 2. hath obſerved. That Gods power is conſpicuous in all Creatures, and even in the leaſt of them the Wiſdom of God is manifeſt.

Des-Cartes telleth us *Materia in toto Univerſo una & eadem exiſtit. Princ. Nat.Phil.Par.* 2. *parag.* 23. And a little after, *Omnis materiæ variatio, ſive omnium ejus formarum diverſitas, pendet a motu.* Matter in the whole Univerſe is one and the ſame, and that all variation or diverſity of Forms which matter hath put on, doth depend on Motion. Which Philoſophers ſeemed to obſerve by their Definition of Nature, *Natura eſt Principium motus & quietis.* For then they underſtood (ſaith he) *Id, per quod res omnes corporeæ tales evadunt,*

dunt, quales ipſas eſſe experimur. But then if we conſider, what is the Firſt Movent that ſetteth Secondary Cauſes in action; we muſt with *Carteſius*, §. 36. acknowledg God to be the Univerſal and Primary Cauſe of motion. Ingenious is his Phanſy, That God made all the parts of matter equal in the beginning both in magnitude and motion, which whilſt moving by Attrition did break off their angulous parts, that became a ſubtile matter fit to make the Sun and fixed Stars; but theſe that became Spherical *globuli*, were for the ſtructure of the Heavens; but the parts of matter which by their figures were unfit for motion, did remain groſs and fit to make the Earth, Planets, and Comets.

But ſeeing I have diſowned imaginary Philoſophy, I ſhall enquire how far Experience giveth light to this opinion, *viz.* That Matter Indeterminate is the only Elementary Principle *ex Quo* is made every compound Body.

If we take a ſurvey of the whole frame of ſublunary Concretes, we ſhall find *Matter* of it ſelf to be unconfined to any One Species: but the ſame *Matter* according to the determination of Forms runneth through any Species, and according to the diſpoſition of its parts doth put on the forms of different Elements; which gave occaſion to Philoſophers ſo much to diſpute the number of Ingredients in a mixt Body, which really are but Secondary things made out of *Matter*, that firſt Principle of Concretes.

From that Experiment of *Mr. Boyle Scep. Chym. p.* 112. before mentioned, of his Diſtillation of a Vegetable nouriſhed only by Water, out of which he procured (according to ſome) the Five Chymical Principles, *Spiritus, Sal, Sulphur, Aqua, & Terra*; we may conclude thus much, *viz.* That *Matter* which made up the body of Water was converted into Salt, Sulphur, *&c.*

Having proved before that a *Succus* or Water is the immediate matter for nutrition of Vegetables; Let us take for Example a *Vine*, which requireth a great deal of moiſture, as may be concluded from its haſty growth, and bleeding of broken ſlips. The increaſe of its bulk is by liquid Sap, which through different ſtrainers and coagulation is turned into leaves, branches, Grapes, *&c.* The juyce of the Grapes by fermentation will caſt a Tartar to the ſides of the Veſſels, which by diſtillation will yield a Salt and *Terra damnata*, the Wine will yield a Phlegm and a Sulphureous Spirit; and yet all from the Sap as the more immediate matter. So that here was but one thing in common, *viz. Matter* indeterminate to this or that Species.

As the *Leſſas terræ* is converted into Graſs, ſo Graſs into Chyle, Blood, and after various Alterations into the Fleſh of a Brute, whoſe fleſh may be converted again into Chyle, Blood and parts of a Man that did eate of that Brute; and by the corruption of the humane Carcaſe is turned again into Earth, which may by Nature be again converted into Water, as well as by *Helmont*'s Alkaheſt, and ſo paſs over a new Stage. The parts of this Brute diſtilled would yield the Chymical Principles, yea the *Ariſtotelian* ſo far as they are conſiſtent with truth; as may be eaſily ſeen by the Diſtillation of the Horns, Hoofs, Fleſh, and Blood of Animals. In all which changes we ſhall find One ultimate reſult, *viz.* *Matter* indeterminate to any One particular Species.

I ſhall eaſily grant, That a Body may be made out of Spirit, Salt, Sulphur Phlegm, and Earth; or of Salt, Sulphur, and Mercury, according to others; yet theſe are but *Elementa ſecundaria*, ſeeing they admit of a farther Reſolution, as well as a Tree or any compound body admiteth a Reſolution into theſe. That cannot be accounted for a Firſt Element, which deriveth its Original *a Priori*: as from the configuration, diſpoſition, motion, or quieſcence of the particles of Matter, not only mixed bodies, but others more ſimple aſſigned for Principles by Sects of Philoſophers may be derived. To inſtance in Particulars, How that the parts of Matter free from coheſion and as it were *in fluore* with perpetual motion make Water; that the opace groſs fixed parts of Matter make Earth, the agile Spherical Particles in a raped motion make Fire, *&c.* would be beyond my intention. Only thus much we find by experience; That in generation and corruption there is One ultimate reſult from all compound bodies, which *Ariſtotle* rightly called *materia prima*, out of which all Natural bodies are firſt made, and at laſt reſolved into. As for example; take a Plant, ſuch as *Mint*, *Pennyroyal*, *Bugle*, *Nummularia*, *&c.* by a Chymical Analyſis it may be reſolved into *Spirit*, *Salt*. *Sulphur Phlegm*, or *Water*, and *Earth*; or according to ſome Chymiſts that look a little higher, or to more remote Principles, into *Salt*, *Sulphur*, and *Mercury*; ſeeing that *Spirit* and *Earth* are but Products of the other three Yet all theſe as Dr. *Sharrock* by the encreaſe of Vegetables in pure Water, and the foregoing Experiments have proved, are but Water transformed. And although Water is neceſſary to Nutrition, and that all Aliment before aſſimulation to its Subſtance muſt be converted into a Liquid, yet Water cannot claim the Property of a Firſt, but Secondary Element, ſeeing that Water it ſelf is convertible into the Subſtance of Animals, Vegetables, and Minerals, as theſe are by *Van Helmont*'s Experiment into Water.

ter. So that the Ultimate reſult in all Corporeal tranſmutations will be *Matter*, the only conſtitutive Principle, from which according to the Plaſtick Power of the *Semen*, or that Divine Impreſs ſtamped at firſt by God Almighty, that is the Formative Cauſe in Concrete Bodies, is produced the difference of Species and Individuals. Which bringeth me to conſider, how cometh the Variety of Animals, Vegetables and Minerals; and the Difference of Waters that our Soil doth afford.

PAR. I. SECT. 2.

BY the Hiſtory of the Creation we find that God created the Heavens and the Earth, but firſt created Matter, out of which He afterwards made bodies different according to their kind. For as Divines tell us, quoting S. *Auguſtine*, *Quod cœlum & terra appellatum eſt, materies erat confuſa quædam de quâ mundus (qui duabus maximè partibus cælo ſcil. & terrâ conſtat) digeſtis Elementis & acceptâ formâ fabricaretur.* Aug. *lib. imperf. ad literam de Geneſi cap.*4. “That which was called Heaven ‘and Earth was a confuſed matter, out of ‘which the world (that doth chiefly conſiſt of ‘two parts, Heaven and Earth) by digeſtion of ‘the Elements and putting on a form was made. And a little after telleth us, *In principio fecit Deus cœlum & terram, id eſt, materiam quæ cæli & terræ formam capere poſſet: quæ materia terra inviſibilis & incompleta erat, id eſt, informis & luce carens profunditas: quæ tamen quoniam moventi & operanti artifici ſubjecta eſſet, propter hoc ipſum quod cedit operanti, Aqua etiam nominata eſt.* The making of the Heaven with its proper form was the work of the ſecond day, *Gen. c.*1.*v.*8. The making of the Seas and the Earth with its vegetables was the work of the third day, *v.* 13. So that the

Heavens and Earth, mentioned *v.* 1. muſt be underſtood only of the matter, or the dark abyſs, on which the Spirit of God moved, in order to poſterior formation. And indeed the next following words intimate as much to us. *The Earth was without form and void.*

This undigeſted Lump of matter the Ancients called a *Chaos*; as we may ſee by *Heſiod* in his *Theogonia*, by *Apollonius in Argonauticis*, *lib*. 1. *lin*. 496. who there ſpeaketh to the ſame effect that *Ovid metamorph. lib.* 1.

> *Ante mare & terras, &, quod tegit omnia, (cœlum,*
> *Unus erat.* ----

Which are excellently rendred by Mr. *Sandys* thus,

> *The Sea, the Earth, all-covering Heaven unfram'd*
> *One face had Nature, which they Chaos nam'd.*
> *An undigeſted lump, a barren load,*
> *Where jarring Seeds of things ill-joyn'd aboad.*

I might cite alſo many more Heathen Philoſophers and Poets, which I ſhall paſs by; only taking notice of their Opinion concerning the Seminal principles of Bodies lodged in that undigeſted lump of Matter. All which I ſuppoſe received their opinions from the writings of *Moſes*, from whom we are taught, that God created all things, but ſome he made actually exiſtent, other things he left to be produced by the Seminal Principles, which He planted in the Chaos, or confuſed Matter. As we may ſee by *Gen.* 2. *v.* 5, *God made every plant of the field before it was in the earth, and every herb of the field before it grew*, viz. the *ſemina* of vegetables, which by the primitive *Fiat*, ſo ſoon as the Matter was digeſted into form, were ſet on work, and brought forth according to the formative vertue of the latent ſeeds. The Waters brought forth Creatures abundantly after their kind, the winged Fowl after his kind, the Earth brought forth the living Creature after his kind, Cattel and creeping things and Beaſt after his kind; and of the duſt of the ground made *He* Man. Upon all which we find a Divine Impreſſion ſtamped or Generative faculty, by which they might be *fruitful and multiply*,

The Earth before *Adam*'s tranſgreſſion brought forth of its own accord graſs and herbs for the Uſe of man, which we may well believe to be from latent Seeds, which now are more manifeſtly requiſite to continue the *Species*. After *Adam* had drew a curſe on the ground, we ſtill find that the Earth ſhould bring forth, but it ſhould be ſuch as were more uſeleſs an unfit for meat, as thorns and thiſtles: but the more uſeful plants it ſhould not, unleſs by humane labour and induſtry. *In the ſweat of thy face ſhalt thou eat bread: Gen.* 3 19.

As God implanted various ſeeds of Herbs in the earth, which as at firſt ſprung therefrom, ſo yet from ſeeds continue their *ſpecies*, being ſet at work by the Divine *Fiat* ſo ſoon as the celeſtial influences and appropriate ſecondary Cauſes are rightly applied with convenient Matter; ſo in like manner hath God the Creator placed variety of Mineral ſeeds in divers parcels of Earth, from which cometh a Diverſity of Mineral glebes, as here Clay, Marle, there Marcaſites of Iron, Alum, *&c.* as Dr. *Jorden Natur. Bath. and Min.Wat. c. 7.* argueth, That *Minerals have their Seeds to perpetuate their ſpecies.*

And that there are Metallick ſeeds in the bowels of the Earth, may be concluded from the Generation and Maturating of a crude Mercurial and ſulphureous juice, until a perfect Metal is formed: As hath been proved *p.* 18. how the *caput mortuum* of Vitriol, expoſed to open Air, will be again impregnated; and freſh Ore of Tin or Lead, where 60 or 70 years before all was extracted, and old mines repleniſhed with freſh Iron ſtones. All which productions depend on the Seminal Principles lodged in ſeveral parcels of Earth, which from a ſucculent Matter form a Body according to the Specification of the *Archeus*. The *ſuccus* of the Earth by the operation of the Seminal Agent, is at firſt converted into a crude Mercury and embrionate Sulphur, which at length by maturation doth become a perfect Metal. So from the Eſurine or common Salt of the earth, according to the diverſity of Glebes, do ariſe different Mineral Salts, ſuch as that of Vitriol, Alum, Nitre, and *Sal Gemma.*

Theſe Salts being diſſolved in ſpring-water ſliding through the veins of the earth, and meeting with a Vitriolick or Aluminous glebe, *&c.* doth become a natural Menſtruum to open the body of a *Minera.* Theſe Salts, as ſo many Keys to unlock the Mineral Kingdom make the current Springs impregnated with the vertues of them; and hence is the Original of Medicinal Waters.

Againſt the opinion of an Univerſal or one Common Salt of the Earth, out of which all Mineral Salts, according to the different Glebes, are made into different *ſpecies*, Dr. *Liſter, de font. med. c.* 6. objecteth ſeveral reaſons, and endeavoureth a confutation of *Helmont*'s Aſſertion of an *Eſurine or Univerſal Salt.* His Reaſons are reduced to four Heads.

1. The Eſurine Salt, as it doth participate of no Quality, to aſſert the exiſtence thereof is but a *gratis dictum.* 2. A *Pyrites* or *Marcaſite* cannot perfect its vitriol under water. 3. It is ſcarce credible that a vein of Iron can be corroded of that Eſurine Salt. 4. Vitriol is not made ſuddenly, or in a moment, but by a gentle aſſiduous germination.

Againſt which reaſons I ſhall offer theſe Experimental Obſervations, proving that there is an Univerſal Salt or Common Matter to them all.

1. There is one thing in common among them, becauſe of the Convertibility of one Salt into another; as a Vitrioline by Alterations may be turned into an Aluminous Salt, witneſs the making of *Turbith Minerale* thus. Add four ounces of oyl of Vitriol to one ounce of Mercury; by ſetting the mixture on a digeſtive furnace the Phlegm will be evaporated, but there will remain in the Bolthead a Citrine powder from the Alkalizate Mercury fixed by the acid parts of the oyl of Vitriol. From this powder edulcorated by waſhings of water, and diſtilled with Quicklime or Pot-aſhes, may be revived a current Quickſilver, yea to its full weight as at firſt. The water that by waſhings edulcorated this powder boyled up, yieldeth an aluminous Salt. Here Vitriolick ſalt is turned into Alum, for the Mercury may be reſtored to its full weight, ſo that the Vitrioline is the only ſalt transformed This is mentioned by Dr. *Simpſon*, *Hydrol. Chym. p.* 60. where an Experiment of his own he giveth thus. "Diſtill oyl of Vitriol and common Salt with a 'gentle heat in a glaſs body or Retort, you 'will find a very volatile ſpirit of Salt will 'come over the helm, which will fume ex'ceedingly, the *Caput mortuum* or remaining

'Salt being diſſolved gives a Salt exactly reſembling Alum. To which I may annex that Obſervation of Dr. *Jorden*, *Natur*, *Bath*. *c*. 7. That in Diſtillation of oyl of Vitriol, the Lute wherewith the glaſſes are joyned will yield a perfect Alum. The affinity (or rather tranſmutability) of Vitriol and Alum are ſo great, that he telleth us, it may be doubted whether they are diſtinct ſpecies of Salts.

2. Set ſeveral plants in the ſame ſoyl, as Scurvigraſs, Wormwood, *&c.* Theſe by diſtillation ſhall yield different ſalts, as the greateſt part of that of Wormwood will be a fixed, but of Scurvigraſs a volatile ſalt. Which variety of ſalts muſt proceed from the different fermentations and alterations of the nutritive ſucculent Matter. If it be *objected*, that each plant attracteth a peculiar *ſuccus*, whoſe particles are anſwerable to the pores of the Vegetable, and ſo ſome Plants take in more of the volatile, and others more of the fixed ſalt. *Anſw.* The ſame Plants, as Wormwood, Beans, yea I had almoſt ſaid All vegetables, by diſtillation yield both volatile and fixed ſalt, although they differ as to the quantity thereof. For the diviſion of Salts into Fixed and Volatile, is only from the degrees of volatization. The fixed or *Alkali* ſalt is not eaſily ſublimed, but will endure calcination in as much as it is deprived of ſpirits, and incorporated with earth; but the *volatile* is

endowed with ſpirits, and may be eaſily ſublimed: either of which containing all the vertue of the Plant, may be called an Eſſential Salt. Yet the proximate Matter before formation might be the Common univerſal Salt, determined by different Strainers and Ferments of Vegetables.

3. The production of *Sal foſſilis* is from the Acid of the Earth, inſinuating it ſelf into the pores of ſtones that are an *Alkali*; it being once penetrated is united with the ſtony parts into a ſaline Concrete, which from its tranſparency is called *Sal Gemma.* Thus an Acid of the Earth ſliding through mountains of ſtone, have converted them almoſt all into a foſſile Salt, as Authors of credit do teſtifie of mountains in *Poland.*

4. That Salts have ſomething in common among them, may be hence concluded. Expoſe the *Caput mortuum* of *Vitriol*, of *Nitre*, of *Alum*, and of S*al Gemma*, to the open air: Each will center upon it the floating ſaline particles of the Air, or elſe imbibe a ſaline *ſuccus*, ſo as to become again impregnate with a peculiar Salt. So that the ſaline particles are indifferent to which kind they are to be appropriated by the latent Seminals.

And that all Minerals, ſtony and ſaline concretions, do come from a *ſuccus*, which is afterwards congealed into a hard ſubſtance, may be concluded from Animals that are found encloſed in ſtones, ſuch as a Toad in the midſt of a Stone, a petrified Fiſh, a Spider in Amber, ſo alſo Flies, Worms, Ants, *&c.* For Stones and Minerals, whilſt in *ſolutis principiis* or *in ſucco*, may environ an Animal as a petrifying juice doth a piece of wood, which being congealed will be as a coat of defence to preſerve them from putrefaction, as *Gilbertus* ſpeaking of Amber hath well deſcribed it. *Mollis primùm & viſcoſa materia fuit, quare muſcas & vermiculos, culices, formicas, in fruſtulis quibuſdam comprehenſos & tumulatos, æternis ſepulchris relucentes continet. Qui omnes in liquidum cùm primum efflueret involârunt, vel irrepſerunt, vel inciderunt.* Gilb. *de magnete, lib.* 2.*cap.*2.

Upon ſuch like conſiderations *Helmont* might well conclude one Common Salt, indifferent to which *ſpecies* it ſhould be determined (but not void of Qualities, as Dr, *Liſter* urgeth) who aſſigneth an Acid liquor ſliding through the veins of the earth for the Original of all Salts. *Quocirca notandum eſt, Sal quoddam exiſtere hermaphroditicum metallorum, quod defectu nominis Eſurinum ſive Acetoſum re & nomine vocari cœpit. Generale equidem & ad omnia metalla accommodabile, adeoq; ſi non primam velut & remotiſſimam eorundem materiam putare placeat, ſaltem eſt metallorum ſeundina, quibuſlibet metallis congenialis.* Helm. *parad.* 3.

The ſecond argument againſt one chief Salt, out of which others are formed, is taken from the *Pyrites*, which (ſaith Dr. *Liſter*) cannot perfect its Vitriol under water. But the making of *vitriolum Martis* or *Veneris* doth evince the contrary. For Vitriol being but a Mineral Salt, that hath preyed on, and combined with a Metal, as with Iron or Copper, the Menſtruum may be aqueous, if there be a convenient quantity of Salt therein, to incorporate with the diſſolved part of metal. In making *vitriolum Martis*, water added to oyl of Vitriol doth only weaken the Menſtruum, that the more ſoluble parts of Iron may be diſſolved and incorporated with the ſaline parts of the liquor: for were the Menſtruum too corroſive, it would inſinuate into the body of *Mars*, and make an impure Salt or Vitriol of Iron.

His arguments againſt the poſſibility of the Eſurine ſalt diſſolving a vein of Iron, ſuppoſe no diſtinction betwixt the crudity and maturity of the *minera*. Although *Aqua fortis* or ſpirit of *Nitre* will not diſſolve Ocre nor the *Hæmatites*, yet either will ſtrongly ferment with filings of Iron, or the more maturate parts of *Mars*. Although the *Hæmatites* be a ſort of Iron-ſtone, and Ocre be the *Terra metallica*, yet thence it will not follow, that the Menſtruum for Iron are the Menſtruums for the *Hæmatites*, which many times is ſoft and like clay, and the Ocre a meer metalline earth. For Bodies muſt have their proper Diſſolvents,

vents, which may undo the faſt and hard contexture of ſome Bodies, but leave untouched the ſofter *compages* of others: Witneſs, an Aluminous liquor will corrode a bar of Iron, but leave ſafe and ſound a piece of cloth, as Dyers daily find by experience. So alſo by the teſtimony of them, at the Alum-works, a Lee made by the decoction of the calcined *minera* of Alum, is boyled in a leaden Ciſtern which it leaveth uncorroded; but a furnace of Iron, or a plate thereof put into the boyling liquor is ſoon torn to pieces. So likewiſe *Aqua fortis* will corrode a bar of Iron, but leave entire a ball of ſoft Clay. As this Eſurine Acid doth prey upon a vein of Iron, it doth incorporate with the more pure metalline parts, and make a Neutral Salt. To the effecting of which a long tedious delay is not requiſite, for we find by the making of *vitriolum Martis*, the ſaline parts of the Menſtruum do ſoon inſinuate themſelves into the pores of the metal. Whence *Helmont*: *Conſtat martis vitriolum ſale Eſurino embryonati ſulphuris & vena (non ferro) ferri, quam ſal eſurinum adhuc volatile lambendo corroſit, in quo corroſionis actu fit aliqualis diſſolutio ipſius venæ, & coagulatio ſive fixatio ſalis volatilis.* Helm. *Parad.* 4.

To the difference of Salts then in the bowels of the earth, theſe three things do concur. 1. An Eſurine Acid, 2. Water to convey this Acid to an appropriate Glebe, 3. a Mineral Glebe.

As Water impregnate with this Acid runneth through the ſubterreſtrial Channels, and meeteth with a glebe of Alum, Nitre, Marcaſites of Iron or of Copper, *&c.* ſo it is determined to this or that ſpecifick Salt, whether Alum, Nitre, Sal Gemma, Vitriol of Iron or Copper.

The Eſurine Acid thus coagulated into Salt, may by the ſubſequent ſtreams of water, or by a free Current of the ſame, bring along with it ſome particles of the mineral ſalt, either floating or diſſolved in it; the more indeed in caſe the Minerals are in *ſolutis principiis* or their Succulencies. If water floweth from a Nitrous glebe, it giveth a cold ſpring, as many there are in *England*: if from an Aluminous glebe, and bringeth ſome of the ſalt thereof, and thereby is the more able to prey on an occurrent *minera* of Iron, it yieldeth *fontes acidulos* or Spaw-waters; ſuch as *Scarbrough* Spaw, *Barnet*, and *Epſom* waters, *&c.* all which Aluminous waters though Chalybeat work by Siedge. If the Eſurine Acid prey chiefly on a *minera* of Iron, the water will be moſtwhat Diuretick, and colour the excrements black, ſuch as *Tunbridg*, *Aſtrap*, and *Stallbridg* Waters, among which that near *Ilmington* in *Warwick-ſhire* may be accounted the principal, no water in *England* being a ſtronger Chalybeat, as I ſhall hereafter prove. If water wherein is this Eſurine Acid meet

with

with no Mineral glebe, as of Iron, Copper, *&c.* it remaineth only a ſower brackiſh water, which with Galls will ſtrike no Purple. Of this ſort there is one famous near *Cheſterfield* in the County of *Derby*: the ſalt of which by Chryſtallization and Evaporation is of an irregular figure, and not a *Calcarious Nitre* or common *Salt*, as Dr. *Liſter* would have moſt of our medicinal Fountains to conſiſt of.

But againſt what hath been ſaid concerning the Eſurine Acid meeting with Marcaſites of Iron or Copper, and being by them converted into a Vitrioline ſalt, which may give eſſence to ſome Springs, Dr. *Liſter, de font. med. Ang. c. 7.* oppoſeth himſelf; telling us, that mature Vitriol is not to be found in any of our medicinal Waters, and that he cannot credit *Helmont*, who ſaith, that by diſtillation he found *Pauhont* and *Savenir*, two *German* Spaws, to contain a Vitriol of Iron. His Reaſons are intimated to us, *Pyrites qui in aere in merum vitriolum, &c.* "The Pyrites or Mar'caſite in open air is turned by its proper ger'mination into a meer vitriol, but under wa'ter doth as it were diſſolve into a ſpirit, ſulphureous *halitus* or Ocre. And afterwards ſaith, "Vitriol is reſolvable into three Princi'ples, *Salt*, *Sulphur*, and *Ocre*; but the Saline 'principle is only owing to the Germination 'in Air.

But had the *Doctor* conſidered, how that Vitriol is found under ground, where we cannot ſuppoſe a free acceſs of air, (if any at all,) he would not have been ſo poſitive in his aſſertion. For the *Hungarian* and *Cyprian* blew Vitriol is digged up near the Copper-mines; the *Engliſh*, *Roman*, and *German* Vitriol, (which laſt partaketh of a little Copper) lie near to Iron ſtones. All which without expoſing to the air will from their Marcaſites yield their diſtinct ſorts of vitriol. And what ſhould hinder the germination of vitriol under ground, ſeeing that vitriol is but a Compound body, of an acid Salt and ſulphureous Earth? The ſulphureous Earth is but the Ocre or *Terra metallica*, that *Mater ferri* vel *Veneris*, which receiveth the Acid, and determineth the ſame according to the Power of the *Semen* latent in the Earth, which may as well convert the Acid of the Earth, as the Saline particles floating to and fro in the air. As for the diſſolution of the *Pyrites* in water, I ſhall eaſily grant that much of its ſaline part may be thus reſolved, eſpecially whilſt it is near its firſt ſucculency; but thence ſee no reaſon to lay its Original upon the Air: neither could ever find any of theſe ſpirits flying off from mineral waters, which the *Doctor* calleth *ipſum metallum vegetans*; for if ſo, then certainly there might be, by the help of an Alembick and Receiver, ſuch a ſpirituous ſubſtance preſerved from freſh Spring-water, which none that ever I heard of could obtain. Tis true, ſome ſteams will fly off from mineral water, as by our ſenſe of ſmelling may be perceived, but theſe *Aporrhea* are but ſome particles winding off, and are the effect of fermentation or heat, yet cannot be collected retaining the full nature of the mineral ingredient. All mixt bodies are ſubject to change; by internal or external ferments, and by the active agile parts and motion, many vapours, as in inſenſible tranſpiration, may fly off, and enter the pores of other bodies, or perhaps put on a new form, but never could be found an eſſential ſpirit of Mineral water.

But by *Spirit* perhaps the *Doctor* might mean Ocre, for he tells us *c.* 7. that Ocre doth 'evaporate from our Baths, and that ſpirit 'which flyeth off is a Metal; and elſewhere will not allow Ocre to be a ſulphureous Earth, but a meer Metal, *merum ferri metallum eſt.* Liſt. *de font. med. c.* 2. becauſe after burning in the fire it may be drawn by the Loadſtone. But *Gilbertus* hath proved, that not only Iron, but many other things will anſwer the operation of the Magnet. *Non ferrum tantùm & magnes à magnete attrahitur & volvitur magneticè, ſed ferrea venæ omnes, lapides etiam alii ut fiſſiles Rhenani & Andegavenſes nigri, quibus pro tegulis utuntur, aliorumque colorum & ſubſtantiarum plurimi ſi præparati fuerint: tum omnis argilla, glis, ſaxaque nonnulla, atque ut planiùs dicam omnis terra firmior, modò pinguioribus & humidis corruptelis defœdata non fuerit,* *ut lutum & cœnum.* And a little after, *Omnia magnete attrahuntur ſolis ignibus præparata, & à recrementitio humore liberata.* Gilb. *de mag. lib. c.* 17. Not only Iron and a Magnet (which is but a more pure *minera* of Iron, or finer Iron-ſtone) may be drawn by a Magnet; but Stones, white Earth, Potters clay, yea all firm Earth, in caſe the Excrements and putrid moiſture are purged off by fire. Tis true the Operation betwixt the Magnet and Iron is great, and conſequently by how much the more of metalline parts of Iron there are in a mineral Earth, by ſo much the more conſpicuous is the Magnetiſm; yet ſimple Earth after Calcination will (though in an inferior degree) ſhew the like effect. But this leading me to the enquiry of a new ſubject I ſhall return to my propoſed matter in hand.

*Du Glos obſerv. on the Min. wat. of Fran.p.*8. rightly telleth us, "That the firſt Beings or 'Embryo's of Mineral Salts are nothing elſe 'but vapours or juices unconcrete, wholly vapourable, And *pag.* 9. The Embryonate 'Salt in the Chalk-ſtones is a ſtony juice, 'which mixeth it ſelf with waters that paſs 'between the beds and interſtices of the ſtones 'in the rocks, but is not eaſily diſcern'd in the ' waters impregnated therewith. The Seminary of Alum and Vitriol is alſo neceſſary in the ſubſtances whence theſe ſorts of Salts are drawn. Waters current in their channels meeting with and diſſolving them, become a proper *menſtruum* to unlock the Mineral Kingdom; and according to the diſſolved *minera*, ſo Waters differ in their qualities.

Upon the variety of Salts and Mineral Earths dependeth variety of Springs. For there are four ſorts of Salt commonly known to us, according to Dr. *Jorden* and others, viz. *Alum*, *Vitriol*, *Nitre*, and *common Salt*; which others, and perhaps with as great reaſon, reduce to three, *Alum*, *Vitriol* and *common Salt*, which laſt may be again divided into *Sal gemma* or *foſſilis*, *Fountain-ſalt*, and *Sal Marine*, becauſe theſe three ſorts partake near of the ſame nature, and work almoſt the like effects. Only the Sea-ſalt being diſſolved in water hath loſt many of its ſharp points, and conſequently is not ſo penetrating as *Sal foſſilis*, from mountains and rocks of which, according to moſt of our modern Authors, the ſaltneſs of the Sea doth take its original. An affinity betwixt theſe Salts Monſieur *Lemery* hath obſerved, who alſo in his *Cour. Chym. Remar. on Salt-peter*, giveth us this Experiment. When *Salt-peter* is boiled a long time in water, and over a great fire, ſome part of the ſpirits fly away, and there at laſt remains nothing but a Salt like unto Sea-ſalt or *Sal Gemma*, which ſerves to prove that *Salt-peter* is only a *Sal gemma* fuller of ſpirits than the other: And if ſo, then Salt-peter may be ranked under the other, and make no different *species* of Salt.

From theſe Salts with which waters may ſingly or joyntly be impregnated, (to which for ought we can tell *Species* of Salt as yet unknown to us may be added) preying upon divers Minerals, muſt needs depend great variety of Mineral waters. As for the Calcarious ſalt aſſerted by Dr. *Liſter*, I ſuppoſe it to be but a kind of *Nitre*, which is centered upon the *Lapis Calcarius* mentioned by *Falopius de Therm. Aq. c.* 8. and by the ſeminary principle thereof doth become a ſtony ſalt, diſcernable enough by ſome clear but cold petrifying Springs.

The variety alſo of Earths, as white, red, or yellow Marle, Clay, Chalk, or other mineral Earths, may cauſe great variety, as to the weight, colour, ſediment, ſmell *&c.* more eſpecially when there is a complication of many in the ſame water.

PART II.

NOw I ſhall proceed to Enquire, what are the Ingredients of *Ilmington-Spaw*, firſt taking notice of its Colour, which is far more pale then Rock-ſpring water. With Syrup of Violets it would turn green, like Alkalizate Liquors with that ſyrup: with Galls, to a Purple; like Martial Vitrioline Waters: for Cuprous Vitrioline with Galls turn muddy with a very little Purple or Black; but of this more afterwards. Its body being of a thick muddy conſiſtence, I weighed (in a very dry Seaſon) a Pint of this Spaw-water againſt a Pint of ordinary Water, but the Spaw exceeded near half a Drachm. Another time after a wet Seaſon and when the Ocre was fallen an old Pint pot of common Pump-water weighing 18 Ounces did equalize (and if either, did turn the Scales) the ſame quantity of the Spaw-water: which may caution us from prefixing a determinate Weight to any Spring-water. Variety in the Weight of Waters may appear by comparing That Salt ſpring water of *Droit-wich* with ſweet ſprings, yea to him that compareth the Waters of ſeveral ſweet ſprings together, For the Eſurine ſalt many times being carried along with the water ſliding through its ſecret *Meanders* or veins of the Earth; of which part inſinuateth it ſelf into, and part corroding occurrent bodies; it fretteth off fragments, ſuch as *fragmenta ferrea* from Iron-ſtones, and particles from ordinary ſtones, which are carried along with the water, and lie latent to the naked eye in its pores, but by Diſtillation, Evaporation *&c.* will appear, Whence of neceſſity followeth a great variety in weight, according to the greater or leſs quantity of *ſabulum* or fragments therein contained.

Then I proceeded to enquire after the Mineral, with which this Spring was impregnated. And firſt I took about half a pint of new milk, upon which in a Porringer I poured this water freſh from the Spring-head, but could not diſcern any coagulation; yea, for any thing did appear, this mixture differed not from a mixture of milk and ordinary ſpring water. After four miles carriage of the water, when the reddiſh Ocre began to ſubſide, I poured upon warm milk from the cow a pretty quantity of this water, and let it ſtand at leaſt twelve hours; but neither in this mixture, nor in milk and this Spaw-water boiled together, did any *Coagulum* appear. Hence I began to ſuſpect, that its brackiſh taſte was not from an acid Salt; therefore on this ſpring-water I inſtilled ſome oyl of *Tar-*

tar, but upon the inſtillation, and the ſtanding of the water all night, a very ſmall curdling did enſue; only the mixture looked more white than the Spaw-water it ſelf, which alteration of colour proceeded from the oyl of *Tartar*. Whereupon I concluded, that no Acid ſalt was here predominant, yea rather as ſuch, ſcarce diſcernable in this Spring; it being, as I ſhall hereafter prove, far nearer to an Alkali than to an Acid ſalt.

Upon an Oaken leaf bruiſed I poured a pint-glaſs full of this Spring-water, and immediately it inclined to a Purple colour: I then try'd it with Galls, and it turn'd firſt to a Purple, but with an addition of more Galls to a black. But deſiring more exactneſs, I cauſed one ſingle grain of Galls finely powdered to be divided into twenty parts, another grain into nineteen, another into eighteen equal portions, *&c.* Upon tryal I found, that the eighteenth part of a grain did ſomething incline a pint of this water to a Purple colour, as might be perceived in a chryſtal glaſs ſet in a clear light; but the ſixteenth part of a grain put into a pint of water, did preſently cauſe a tincture plainly diſcernable and inclining to a purple; but the eighth part of a grain fully turned a pint to a Purple, much reſembling in colour Syrup of Damask Roſes mixed with ordinary Spring-water. Afterwards the more Galls were added, by ſo much the more it altered towards a black, until it turned into a muddy inky Liquor. Which Liquor by the inſtillation of ſpirit of *Vitriol* was cleared, but by oyl of *Tartar* or ſpirit of *Harts-horn* was again muddied; with ſpirit of *Nitre*, oyl of *Vitriol*, or *Aqua fortis*, *&c.* became clear again: for what an Alkali muddieth, an Acid again cleareth.

Now conſidering the ſmall quantity of Galls, with which a Pint of water was thus tinged, I believe we may compare our new found *Spaw* (in this particular) with any of the Engliſh Medicinal waters, yea with the *German Spaws* ſo much in requeſt.

But it being ſufficiently proved by the Learned Dr. *Simpſon* in his *Hydrologia Chymica*, that a ſolution of the *Calx* of Alum, or of Alum-ſtones with the addition of Galls, will turn to a deep Purple, and from thence with more ſolution of Galls added becometh blackiſh and opacous almoſt like Ink. Upon which ſpirit of *Vitriol* being poured, it becomes clear again; with oyl of *Tartar* again muddied, and with ſpirit of *Vitriol*, of *Nitre*, *Aqua fortis*, *&c.* reduced to its priſtine clarity. He alſo in his *Hydrological Eſſays* writeeth thus. "Not only Galls will ſtrike a pur'ple tincture with the Alum-ſalt (got before 'the addition of Kelp and Urine) diſſolved 'in diſtilled or freſh ſpring-water, but alſo the 'ſame may be done by other bodies, whoſe 'texture of parts are congeneal; as for example, the inner part of the Oak, the roots of 'Tormentiſe, Avens, Biſtort, Clove-gillyflowers, and the flowers called *Balauſtia.* All 'which like Galls will ſtrike a purple with 'water wherein the Alum ſalt is diſſolved, yea 'and will alſo become clear again by the in-'ſtilling a few drops of oyl of vitriol, and 'with the oyl of *Tartar* will become turbid 'and muddy, *&c, Hydr. Eſſ. p.* 132.

I began to enquire farther into this *Spaw*, upon conſideration that a Purple colour, and from thence a dark muddy liquor like Ink, might be made with Galls from another Liquor than from a Vitriolick water or Solution. And that Vitriol diſſolved, by an addition of Galls will ſtrike a good black, is evident from the ordinary way of making black writing Ink, Whereupon I compared Aluminous waters and this Spring.

I made a Solution of Mineral Alum with fair wtter, which preſently upon the inſtillation did curdle Milk; but upon the mixture of Milk and this Spring water no Coagulation did enſue. And that Alum conſiſteth chiefly of an Acid ſalt all-ſufficient to coagulate milk, is apparent by the mixture of a Solution of ſimple Alum ſalt, with a Solution of ſalt of Tartar, Wormwood, or any Vegetable fixed

Salt; from whence will ariſe a turbid liquor with Coagulations in it, which *Coagula* are cauſed by the mutual conflict of different Salts, deſtroying each other until a Third and Neutral Salt reſult therefrom.

Beſides, Aluminous Springs are purgative, witneſs the *Scarbrough* Spaw, *Epſom* and *Barnet* Waters, *&c.* but this near *Ilmington* worketh moſtwhat by Urine. Yea perhaps (and truly) I might conclude, That this *Spaw* in reſpect of its mineral iugredients worketh not by Siedge. I know it may be objected, That ſome perſons drinking of this water do thereupon find a looſneſs, perhaps to the number of four or five ſtools or more, To which I might anſwer,

1. That any ſimple Spring-water drank in a large quantity, will purge by its own weight: for as it lyeth heavy upon the ſtomach and inteſtines it oppreſſeth Nature, whence the Periſtaltick motion is excited to expell that which infeſts and is burdenſome; and if the water doth much oppreſs the ſtomach before it paſs through the *Pylorus*, vomiting is the effect according to Dr. *Willis*. *In vomitu fibrarum motricium ſpaſmus ab alteris earum finibus, viz. ſiniſtris incipiens & ſtatim violentus & impetuoſior factus, totam ſtomachi cavitatem ſimul collectam & valdè coarctatam, verſus ſiniſtrum orificium corripi & illac evacuari cogit. Cujus ratio eſt, quoniam ſi quid valde*

incongruum ac naturæ infeſtum ſtomacho inſederit, illud non ordinariâ viâ per inteſtina, ut per anum expellatur, circumferri, verum exitu propiori excerni debet. Willis *Pharm. ration. ſec.* 2.*cap.*1. *de vomitione. parag.* 5. The ſame reaſon he giveth for purging by Stool, only by a contrary motion of the Stomachical and inteſtinal fibres from a leſs irritation, which motion is continued *uſque ad anum.* We cannot ſay then, that this *Water* is purgative by its Minerals, as I ſhall more evince when I ſpeak of its Eſſential parts. For

2. If this *Spaw-water* as ſuch, were Cathartick, then it muſt have the ſame effects on all perſons, allowing a proportionate quantity according to the Conſtitution of the Party: but that it is not, Experience teſtifieth. For many find great Coſtiveneſs hereby, but a great Secretion by Urine. Yea I have known ſome perſons that have ventured upon five Pints for the firſt Doſe to begin their Water-courſe; yet inſtead of a Purge, found their Excrements to come off in blackiſh hard *Scybala.*

3. To whom this Water becometh a Cathartick, they muſt be either of a weak conſtitution, ſoon oppreſt by a large quantity of water, or elſe whoſe bodies abound with ſharp humors (as Scorbutick perſons, *&c.*) allſufficient to produce a *Diarrhœa* or looſneſs by a long irritation of the fibres: whence the Periſtaltick motion being once excited, Na-

ture as through its common Sink expelleth its peccant matter. For if according to Dr *Willis*, not only the *ſuccus Pancreaticus* and *Bilis*, but the ſerous humors alſo in their natural *Craſis*, by Contraction of the tunicles ſqueezed out of the inteſtinal Glandules to make the common *Ductus* ſlippery, and irritating the fibres, do promote Purgation; much more then according to *Sylvius*, when the Saline Principle becomes too much exalted.

To which I might add a fourth Cauſe, why this *Spaw* ſhould become to ſome perſons, and at ſome times, a Cathartick, *viz.* an Inclination to a Lask, whether it be from a Pravity of Humors, Obſtructions of the Veſſels, *Viſcera*, &c.

Beſides that, Alum is an Acid, as I have already proved, and alſo is a Cathartick; both which properties are not to be found in this Spaw, comparatively more than in ordinary Spring-water. I obſerved alſo, that the Excrements of thoſe that drank this water were turned blackiſh, which is a conſequent to the taking of Chalibeat Medicines, but not to the drinking of Aluminous waters.

For farther tryal I took about two Quarts of this water, and after Evaporation ſet it to Chryſtallize, but could not find any Salts ſhot to the ſides or bottom of the veſſel. I therefore

fore evaporated it *ad ſiccitatem*, and found left a reddiſh white powder, upon which I dropped ſpirit of Harts-horn; but it made no ebullition or efferveſcence, but with an Acid did make a great ebullition with fumes: quite contrary to Alum, which maketh a plain efferveſcence with ſpirit of Harts-horn, but with an Acid ſtirreth not: which proveth, that an Aluminous Salt is not found in this *Spaw*.

Becauſe oyl of *Vitriol* and ſpirit of *Nitre* mixed together cauſe a great efferveſcence, and from thence ſpirit of Nitre is concluded upon by Dr, *Grew* in his *Tractate of Experiments* to be a Subalkalizate Acid, becauſe alſo that ſpirit of Nitre and Mercury preſently boyl up; it put me upon Enquiry, Whether a Nitrous liquor was the Menſtruum to the Mineral of this *Spaw-water*.

But by the way I ſhall propoſe one Paradox, taken notice of by Dr. *Simpſon*, *Hydrol. Eſſay p.* 142. quite contrary to the received opinion of vulgar Chymiſts, *viz.* That Nitre, as Nitre or before it hath ſuffered the force of fire, is not an Acid. For if Nitre were an Acid, then it being put into boyling milk would curdle it; that it will not, Experience teacheth, yea no more than *Sal Gemma*, neither of which do become acid until they have undergone a fiery Tryal, whoſe ſpirits drawn off will ſoon curdle milk. Which ſeemeth to confirm that opinion of Monſieur *Lemery* before mentioned, *viz.* That Nitre is only a *Sal Gemma*, fuller of ſpirits than the ordinary *foſſile Salt*, becauſe when the ſpirits of Salt-peter by boiling over a ſtrong fire are fled away, there remaineth only a Salt reſembling Sea-ſalt.

That Nitre, before its particles are acuated by the ſtreſs of fire, is not acid, may hence appear: becauſe it will make no Ebullition with a Lixivium of Salt of *Tartar*, nor any other *Alkali*, which any Acid will do. And the ordinary way of making *Fixatio Nitri*, by putting a burning coal into the Crucible or Mortar wherein is Nitre, proveth; That when the volatile parts are fled off, (as may be perceived by the great detonation) *Salt-peter* is become a plain *Alkali* ſalt.

Neither for my part can I approve of *Schroder*'s Definition of *Salt-peter*. *Sal Nitrum eſt ſal ſulphureum ſeu* φλόγιστον, *ſalſo amarum ex terrâ pingui excoctum.* I know it may be urged, that Salt-peter yeildeth Red fumes or vapours, when its ſpirits are drawn over the Helm, which ſeem inflammable and ſulphureous; and that Nitre flung upon burning coals will burn moſt vehemently, and with great noiſe; and that the ſtrength of Gun-powder proceedeth from the Elaſtick force of Nitre, its ſpirits taking their Exploſion from the inflammation. To which may be anſwered,

ſwered, That Sulphur is the chief Principle of Inflammability, but This I deny to be in ſimple Nitre. For about Nitre in a Crucible or earthen pot make *Ignis Rotæ*, or the moſt vehement fire that can be; yet the Nitre without an addition of Sulphur ſhall not take flame and burn, which muſt have been a neceſſary Conſequent were Inflammability appropriate thereto. Let but a ſmall quantity of Sulphur be added as that of a burning coal, *&c.* with great impetuoſity the volatile parts fly off; even as a great wind that increaſeth the flame of combuſtible matter, but of it ſelf is not capable of accenſion, ſo Nitre by its volatile parts like bellows doth blow up the ſulphureous parts of a Coal that are the principle matter of Flame. Were theſe Volatile parts inflammable, then once accended, like other combuſtible matter in a ſufficient quantity, they would totally waſte. But in fixing of Nitre it is obſerved, that as the burning coals waſte, ſo the flame decays; but by putting on freſh coals the flame is renewed, and ſo until all the volatile parts of Nitre are gone: as Monſieur *Lemery* well obſerved, *App. Cour. Chym Remar. on. fix. Nitr. p.* 83. As for the Red vapours yeilded in Diſtillation, they are not without Sulphur capable of flame, and the ſudden Exploſion thereof in Gun-powder is from the quick accenſion of Charcoal and Brimſtone, to which doth concur the flatulent Exploſion of the volatile parts of Salt-peter in a rapid motion. Arguments againſt any ſulphureous principle of *Salt-peter* might alſo be taken from the Whiteneſs of the flame when mixed with Sulphur, and from its cooling Quality, which is contrary to the effect of a ſulphureous body.

Upon farther Tryal I could not find Nitre to be any Ingredient in this Spaw. For in the whole Anatomy of this Water by Evaporation, Diſtillation, Cryſtallization, *&c.* I could not find the leaſt footſteps of Nitre, much leſs any of its Salts ſhot into its uſual *Styria's*. Beſides, the Powder left after Evaporation ſheweth its ſelf to be far different from a Nitrous ſalt, as I ſhall hereafter prove.

But obſerving this Water after its being expoſed to the open air for ſome time, either ſtagnating at the Spring-head, or elſe as it is ſet in open veſſels hath a blewiſh *Cremor* ſwimming on the top or ſurface of the Water, much reſembling waters that ſtand long upon ſulphureous bogs; I began to enquire, whether this might not be a Sulphureous Spring, like that at *Knarsbrough*, &c.

By an *Analyſis* of this Water into its Principles, not one grain of combuſtible Sulphur is to be found In its Diſtillation in cloſe ſtopped veſſels, the Water that firſt comes over is inſipid, it will not ſtrike a Purple by an addition of Galls, ſo neither will the Spring-water when its Ocre is precipitated by being long expoſed to the open air, neither will any Sulphureous Smell of the diſtilled Water ſtrike the Noſtrils. What remains in the bottom after Diſtillation, and alſo the Sediment precipitated after long ſtagnation, I tryed with burning Coals and a red hot Iron, but could not perceive the leaſt flagration. Now were there any Sulphur, (I mean as to the body thereof) it would ſhew its ſelf a combuſtible matter on the Top after ſtagnation, like the *mare Aſphalticum*, and in *Italy* the Springs at *Maianum*, *Saſſalo*, and at the foot of *Veſuvius*, with many more mentioned by Dr. *Jorden*, *nat. Bat. c.* 6. to which I may add that famous Rivulet ſpoken of by *Agricola*,

Sulphureâ Nar *albus aquâ*,---

Nar is white with its ſulphureous Cream, *Agr. de natur. eor. Effl. ex ter. l.* 2 Or elſe the Sulphur muſt ſubſide with the Vitrioline Ocre of this Spring; for as the Water letteth fall its vitrioline Ocre, ſo it becometh effete in its vertues. But as no Oyl nor *Bitumen*, ſo neither Sulphur will mix *per minima* with Water; its parts being heterogeneal to theſe of Oyl or Sulphur: whence there can be no mixture unleſs by a ferment. The *Compages* of the Water then being diſſolved, and by letting fall its vitrioline Ocre becoming effete and inſipid, the Sulphur muſt have ſhew d it ſelf by a combuſtible Cream, or Sediment, had any been there as to its body.

It may be then Queried, What maketh this *Cream* on the top after ſtagnation, and what is it that giveth a ſtrong Odour to this ſtanding Water?

Anſw. A blewiſh skin or *Cremor* is common to all Vitrioline or other Mineral waters, and to all waters that ſtand long upon a Bog: which skin taken off, and put upon burning coals, giveth a fetid ſmell. But as I have ſaid before, Mineral Sulphur as to its body is not here, How comes then this fetid ſmell? Waters may yeild a ſulphureous Cream and ſmell two ways, *Firſt*, when a bituminous matter iſſueth forth with the Spring-water, as in the Springs about the *Mare Aſphalticum*, at *Averne* in *France*, at *Pitchford* in *Shropſhire*, and at many places as we are informed by *Agricola, de nat. eor. Eff, ex ter. lib.* 1. *and* 2. For the Watery and Oyly parts being heterogeneal, there can be no perfect Union; whence the Oyl muſt either ſubſide, or elſe turn to a Cream at the top. Or *ſecondly*, Waters may get a ſulphureous Cream and Smell by putrefaction. For Waters, but more eſpecially Mineral, by ſtanding in the air let fall their ingredients, and caſt up ſulphureous particles to the top. Becauſe the Air by its ferment diſſolving the *Compages* of Water, doth generate a Sulphur *de novo*, as in long ſtanding Ditch-water; or elſe doth cauſe the particles of *Embryonative* Sulphur, or Sulphur *in fieri*, to ſwim at the top, (for combuſtible or Mineral Sulphur I cannot find in this *Spaw*) as of water ſtanding on Bogs, or black mooriſh ground. So that this Water expoſed to the air, may by a putrefactive ferment generate a ſulphureous Cream *de novo*, or elſe caſt up its *Embryonative* Sulphur, (all-ſufficient to cauſe the Cream and Smell) which it hath got from the Marcaſites of Iron or Vitriol, that are the main Ingredient in this Spaw, as I ſhall anon prove. And that *Marcaſites* of Vitriol do contain an Embryonative Snlphur, take that Concluſion deduced from Experiments by Dr. *Simpſon*, 'That the Marcaſites of Vitriol and Alum 'have an *Embryonative* Sulphur connatural 'with them, produced out of the ſame Mine-'ral Seed; for inſtance, the Sulphur cruſt, ſe-'parated by calcination of the Alum-ſtone; 'and in the Vitriol Marcaſites I find, that put-'ting them into the fire, they burn of a blew 'flame, and have a ſulphureous ſmell; in both 'theſe the Sulphur is really anſwerable to the 'common Sulphur or Brimſtone. *Hydrol. Eſſ.* p. 61.

But by way of Objection, there is an uſual Obſervation, that may ſeem to prove the common Mineral Sulphur, and not an Embryonate, to be in this Spring, in caſe Marcaſites of Iron do concur to the making up of this *Spaw*, viz. many Iron-ſtones contain a plain Brimſtone, as may clearly be diſcerned by the naked eye, by the fetid ſmell and blew flame in burning them at the Forge or Iron Mills.

Anſw. Although there is found many times among Iron-ſtones a plain Brimſtone, yet we have no Demonſtrations to conclude that it is here. But ſuppoſe that it ſhould be among the Marcaſites, that are chiefly concerned to the effecting this Mineral Spring; yet Sulphur whether in its own proper Earth, or Mineral veins, muſt have its proper *Menſtruum* in order to its Diſſolution. Now an Alkalizate Salt (and not an Acid) is the proper *Menſtruum* to open the body of Sulphur, that it may ſhew it ſelf apart: but a Lixiviate Salt I cannot perceive to be the Menſtruum to unlock the *Minera* of this Spring, for then muſt the Sulphureous part have plainly manifeſted it ſelf by tinging of Silver and combuſtible Cream, neither of which are here apparent. And beſides, Lixiviate liquors are uncapable of diſſolving Iron, for *Mars* partaketh moſtwhat of an Alkali Salt: upon which account Chalybeat Preparations (wherein the Body of Iron is to be opened) do require an Acid Menſtruum; as the *Crocus* or *Saffrons* of *Mars* with many more might teſtifie. For let the Preparation of *Crocus* be performed by expoſing the Iron for ſome time to the Dew or Rain, or by ſpirit of Nitre, Sulphur, *&c.* yet ſtill by examination we ſhall find an Acidity in the Diſſolvent, by which it is able to corrode *Mars*. The Odour then and Cream of this ſtagnating Water muſt be by its ſmall quantity of *Embryonate Sulphur* brought along with the *Mineral*, and manifeſted by a putrefactive ferment. For a *Minera* in its crude parts, or *in ſucco primitivo*, will ſooner ſhew it ſelf, than in its faſt compact ſubſtance, that requireth a ſtronger or more peculiar *Menſtruum*.

It being a conſequent to vitrioline Solutions to turn to a Purple by addition of Galls, by addition of more Galls to turn dark, and from thence to a thick muddy inky Liquor; I began to Query, Whether this Spring was vitrioline.

As for Vitriol or Copperas I find it agreed upon by the moſt eminent Authors, to be made of an Acid Salt preying upon a Mineral, whoſe Particles it combineth with into a cloſe texture. So that a Mineral containing ſulphureous Earth, the Parts of Natural vitriol may be concluded, An *Eſurine* or *Acid Salt*, *Metalline Particles*, and a *Sulphureous Earth*. According to the Diverſity of Minerals, on which the Acid preyeth and combineth with, ſo different Vitriols do ariſe. All which (as yet known) may be reduced to two Heads, *viz*, *Vitriol of Iron*, and *Vitriol of Copper*. *Vitriolum album* hath but little of the Metalline part, and therefore by ſome is reckoned for a diſtinct *ſpecies*. Becauſe of its Mildneſs, it may with a little Preparation not only become an Internal Remedy, witneſs the *Sal Vitrioli vomitivus*, but alſo may be applied to tender Parts, as it is uſual in Eye-waters.

Vitriol of *Copper*, called by ſome *vitriolum cæruleum* from its blewiſh colour, by ſo much the more it partaketh of Copper the more blew it is, ſuch as the *Hungarian* and *Cyprian* Vitriol. Among the Particular ſorts of Vitriol of Copper there is difference, according to the quantity of the Acid or Eſurine Salt, and as it partaketh more or leſs of the Copper.

Vitriol of *Iron* is commonly Greeniſh, as the *Goſlarick*, *Swediſh*, *Engliſh*, and *Roman* Vitriols. Theſe partake moſt of *Mars*, and conſequently are not ſo Cauſtick as them of Copper, for the more Copper the more Cauſtick are the Vitriols, and by ſo much the more fit for compoſition of Corroſive *Menſtruums*. As for inſtance, the *German* greeniſh Vitriol, containing more of Iron than of Copper, is reckoned among the vitriols of Iron; but by reaſon of a ſmall quantity of Copper therein comprehended, is found to be more Corroſive than the ordinary green Vitriols; although far ſhort of the Blew, whoſe Metalline parts are Copper; yet I deny not, that there may be a complication of Iron with Copper in the ſame Marcaſite.

As for the Red Vitriol our *Druggiſts* have lately obtained from *Germany*, and by ſome eſteemed as a diſtinct *ſpecies* of Vitriol, it ſeemeth to be nothing but a *Terra Vitriolica*, from which the Mineral Salt is ſeparated by preterlabent Springs, or elſe is not as yet endowed with an Eſurine Acid, but remains as a *Mater Vitrioli* or proper Bed for its generation. By its aſpect it reſembleth the Cholcothar of *vitriol* of *Iron* which is rediſh, but that of Copper like a yellow Oker,

Beſides theſe Natural vitriols already mentioned, there are many Artificial ; ſuch as vitriols adulterated (by way of cheat) in imitation of the Natural, as much is to counterfeit the *Roman* Vitriol. By Solution, Evaporation, Cryſtallization, *&c.* we may find a great deal that paſſeth for true Natural Vitriols to be but Factitious adulterated Compoſitions by addition of Salts made ſhoot into ſtrange Cryſtals with variety of colours.

Notwithſtanding that all the ſorts of Natural Vitriol will ſtrike a Purple, and from thence a muddy Inky liquor by a mixture of Galls; yet I conclude the *white Vitriol* and *Vitriol* of *Copper* not to have exiſtence in this Spring, for theſe Reaſons.

1. White vitriol is vomitive, witneſs the *Gilla vitrioli*, ſo alſo is the vitriol of Copper, yea excepting ſome Preparations of Mercury the greateſt Emetick of Metals: And beſides, *vitriol* of *Copper* is a violent Cauſtick, as Chirurgical practice aſſureth us; neither of which Properties do agree to this Spring.

Secondly, the red Oker that ſubſides out of this ſtagnating water, and is to be found among the ſtones at the Spring-head in a conſiderable quantity, doth exactly reſemble the mineral Earth of Iron, and not of Copper; which is carried along with the Metalline parts diſſolved by the Eſurine Acid; which Earth as the *mater ferri* becauſe of the body of *Mars* in it, being preyed upon, doth become as a *Crocus Martis* or Ruſtings of Iron.

If it be Queried, Whether the Mineral of this Water may not be *Copper*, but in ſo ſmall a quantity, as not to have ſo powerful an Operation as is required to an Emetick; like ſpirit of vitriol although a Cauſtick, yet a few drops may be ſafely taken inwardly, when there is a large *Latex*, as it is frequently and with good ſucceſs in cooling Juleps.

Anſw. This Spring is very ſtrong of the Mineral, witneſs the Tincture with ſo ſmall a quantity of Galls, (as before I have mentioned) any herein not any water in *England* doth exceed; ſo that were it from an Emetick or Purgative Mineral, as from Alum or Copper, This muſt have been a Cathartick, but we have no ſuch aſſurance from Experience. Beſides, were it from Copper a great vomitive, then the Mineral being mixed in a leſs quantity muſt purge by Stool; for as Dr. *Willis, Pharm. ration. ſect. 2. c. 1. de vomitione.* hath proved, When the irritation of the in-

teſtinal

teſtinal fibres is leſs than is required to cauſe a Vomit, it worketh by Siedge. In vomiting the Spaſms of the Fibres being violent, Nature is neceſſitated to evacuate the next way, but leſs violent by the irritation of a Cathartick, which is not of ſo quick an Operation, nor ſo nauſeous and offenſive to the Stomach as an Emetick; wherefore the Natural motion of the fibres is not inverted, but continued *uſque ad Anum* to work by Stool. Now had here been ſo much Copper as clearly to have manifeſted it ſelf; this *Spaw*, if not an Emetick, muſt have been a Cathartick, at leaſt in an inferior degree.

Upon conſideration that a Solution of *vitriol* of *Iron* with Galls would ſtrike a Purple, and from thence a black by addition of more Galls; I began a compariſon betwixt this Spring-water and vitriol of Iron, otherwiſe called *Sal Chalybis*, made out of filings of Steel and oyl of Vitriol.

I took a Pint of fair Spring-water, in which I diſſolved a quarter of a Grain of *Sal Chalybis*, then I took a Pint of *Spaw-water*; into each of them ſeverally I put a quarter of a grain of Galls finely powdered, and upon the mixture both became Purple. The mixture with the *Sal Chalybis* turned more to a blewiſh, but that of the *Spaw* more to a rediſh Purple, much reſembling fair water mixed with a little Syrup of Damask Roſes. The diſſolution of the *Sal Chalybis* in fair water and the Spaw-water had the ſame taſte, as near as Art could imitate Nature. A ſmall variation in Colour, and as little as may be, in taſte may well be allowed, by reaſon of the rediſh Oker contained in the Spaw, that upon ſtagnation of the Water will ſubſide, which muſt needs cauſe it to incline ſomething more to a right Purple, and to be ſomething more ſtyptick than the ſolution of *vitriolum Martis*, containing none of this red Oker. Neither can it be expected, that the Spaw-water, after its Oker is fallen, ſhould be of the ſame colour with a ſolution of *Sal Chalybis.* For the Oker that falleth is not a ſimple Earth, but carrieth with it a great deal of the Mineral and Saline parts; for in ſo much as the Oker falleth, the Water looſeth its Tinging property, yea degenerates from a Mineral water, and at length becometh effete in its vertue.

By addition of more Galls to the Solution of *Sal Chalybis* and to the Spaw-water, both began to turn to a dark, and at laſt to a black inky Liquor. Then I poured into each a few drops of ſpirit of Vitriol, and both returned to their priſtine clarity; then I inſtilled upon each a few drops of oyl of *Tartar per Deliquium*, and again they became muddied, but with ſpirit of Nitre both became clear again. From whence I infer a Similitude betwixt this Spaw-water and a Solution of *Sal Ghalybis*

bis or Vitriol of Iron, being alike in their variation of Colours, Precipitation, and reduction to Clarity again.

But before I ſhall proceed to more Experiments, to prove a farther Similitude betwixt this Spaw-water and vitriol of Iron, I ſhall ſpeak ſomething as a *Rationale*, Why theſe have alike Precipitation, Variation, and Reduction, which may farther illuſtrate an Affinity betwixt them from the forementioned Experiments.

Why there is ſome difference in colour betwixt a Solution of *ſal Chalybis* in fair water which inclineth to a Blew, and this Spaw-water (I mean when Galls are added to both) which inclineth more to a Purple, as I ſaid before is from the red Ocre in the Spaw-water. For all Natural vitriol containeth in it a *terra Metallica*, whoſe Colour may be changed into a brown, black, *&c.* according to the different *Analyſis* of Vitriol by fire. But before any Chymical Preparation of this Spaw-water its Oker is red, as may appear by the Stagnation of the water, to them that make Inſpection at the Spring-head,

Now if we look into the Nature of the thing, we ſhall ſcarce find any or no difference betwixt the Spaw-water and a Solution of vitriol of Iron. For Blew and Purple are but a Black in a remiſs degree; for proof hereof

I could cite the Tryals of experienced Authors, all-ſufficient to confirm the Aſſertion. But inſtead thereof take one or two Obſervations.

Firſt, that Blew and Purple do only differ by addition of a little Red, Take a Blew, as *Indy-blew*, *&c.* ground into a fine powder; which being divided into two parts, add to one part a little Vermilion finely powdered, and it giveth a Purple, by reaſon that the Blew and the Red particles do refract their rays *intermixtim*, which cannot be diſtinguiſhed but by good Microſcopes. If this be the reſult from dry Powders, much more then and farther from diſtinction when Bodies are *in fluore*, and the Particles of one implexed and inſinuated into the Pores and interſtices of the other.

Secondly, That Blew and Purple are but a remiſs degree of Black, take this Obſervation to the preſent buſineſs. By an addition of a ſmall quantity of Galls to the Spaw-water, and alſo to a Solution of vitriol of Iron doth ariſe a Purple, and a Blew inclinable to a Purple; even ſo it doth in making of Ordinary ink, when to a ſolution of Vitriol there is made an addition of a ſmall quantity of Galls, a Purple is the Reſult, but by addition of more and more Galls it turneth to a Black or inky Liquor. So that Blew or Purple is but a *medium* to a Black, for the ſame thing by variation in its quantity maketh both.

But let us ſuppoſe a difference in colour betwixt the Spaw-water and a Solution of *ſal Chalybis*; yet that will rather prove a different Poſition of the Parts of Matter, cauſing a different refraction of Light, than a Difference in the Nature of the Subjects. For the ſame Thing by altering the modification of its Particles, may alter its Colour. So Syrup of Violets, by inſtillation of a little *Oleum Tartari per Deliquium*, changeth from a Blew to a famous Green, A few drops of ſpirit of Nitre inſtilled on a conſiderable quantity of this mixture, or on freſh Syrup, will change it into a Carnation Red. But neither of theſe Liquors had any reſemblance of Red, or Green, before the Mixture, Divers changes in colour I could inſtance, made by inſtillation of clear Liquors upon a Decoction of Logwood, *&c.* and by mixture of Tinctures. By the frequent practice of Dyers we are informed, that the ſame thing *viz.* a Decoction of *Glaſtum* will produce a Green from a Yellow, and a Ruſſet from a Red, only by a previous preparation with Alum: Yea I could produce a Liquor I have got from a vegetable, (which Experiment I lighted upon by accident, whilſt making ſome ſcrutiny into *Colours*) that by inſtillation of another Liquor as clear as rock-water, will ſtrike an excellent Scarlet; which colour ſeemeth not to have the leaſt footſteps in the ingredients before they are mixed. Many ſuch like Obſervations, I queſtion not, may be found by Tryal on mixtures, yea for ought I know to compare with our *Bow-dye*, without the leaſt recourſe to *Chochineel.* But this being to dive Into the Dyer's Trade, I ſhall only take notice from ſuch Experiments, That Colour dependeth more on the Texture of Parts differently reflecting the Light, than from a difference in Matter. So that a Blew or Purple will be no Material difference betwixt a Solution ef Salt of *Mars* and this Spaw-water, with Galls added to both. And that this Oker is the main occaſion thereof, may be hence concluded. I made a Solution of Engliſh vitriol in fair water, which with a ſmall quantity of Galls did ſtrike a Purple very near as deep as this Spaw-water: but let vitriol be diſtilled, and reunite all its parts except the *Colcothar*, and with fair water and Galls you ſhall fail as to the former Purple; and in all vitrioline Solutions with Galls may be obſerved, The more *Terra Metallica* the deeper the Purple.

When Galls are added to this Spring-water, and alſo to a Solution of *Sal Chalybis*, an Alteration in Colour (as I ſaid before) and an inky ſmell doth alſo enſue. The reaſon hereof is this; An inky liquor or Ink (and conſequently will ſmell as ſuch) is made by a ſolution of vitriol precipitated, or made opacous by the addition of Galls; whoſe ſtiptick parts do make *Coagula* with the vitriolick, and hurry the vitriolick out of the former poſture, and make them like ſo many confuſed Atoms; they alſo fill theſe interſtices and pores of the water, which before made a diaphanous body, but is now become a turbid, confuſed, and conſequently a blackiſh liquor. In the ordinary way of making ink, Gum Arabick and Sugar is added to the Galls and vitriol, by reaſon they cauſe a thicker conſiſtence, and their glutinous parts buoy up theſe confuſed Atoms and *Coagula*, which by long ſtanding would ſubſide, and ſo the Solution return diaphanous.

The ſolution of vitriol of *Mars* and Spaw-water, by inſtillation of ſpirit of Vitriol, ſpirit of Nitre, or by other Acids, are reduced to a clear conſiſtence; becauſe that ſpirit of Vitriol, *&c.* doth work upon and ſcatter thoſe confuſed Atoms and *coagula* made by the Vitriol and Galls, which the Galls had cauſed to float up and down in a confuſed poſture. Wherefore the Liquors return clear, the Acids having expelled the ſtiptick and Alkalizate Particles.

By inſtillation of oyl of *Tartar* theſe Liquors become again turbid and muddy inclinable to an inky colour. For an *Alkali* precipitates and deſtroys an Acid, ſuch as ſpirit of Vitriol, ſpirit of Nitre, *&c.* and bringeth into confuſion what an Acid had cleared, and doth by deſtroying the Acid drive out its

Particles from the interſtices and pores of the water, and ſets them, with them of the Gall as yet unprecipitated into confuſion; ſo that the *coagulum* betwixt the vitriolick parts of the Water and Galls reſumes it ſelf. Upon the inſtillation of ſpirit of Nitre, both became clear again, and with ſpirit of Harts horn both again turbid and muddy, for the ſame reaſons before alledged.

Whence I infer a ſimilitude betwixt a Solution of Vitriol and this Spaw-water, as to Precipitations and Reductions by the inſtillation of Alkalizate and Acid Liquors or Salts.

For farther tryal and proof that this *Spaw* is vitrioline, and that only, I took two or three quarts of this Spring-water, and evaporated it in an earthen veſſel *ad ſiccitatem*, where it left behind a rediſh white powder: on ſome of it I let fall a few drops of ſpirit of Nitre, and immediately a great ebullition with froth and fumes did ariſe with a ſenſible effervelcence. Upon the ſame quantity of powder I let fall ſome ſpirit of vitriol, and the like effect did enſue. I let ſtand a quart of this ſpring-water in an open veſſel, and another quantity in a glaſs-bottle cloſely ſtoped; out of both in a ſhort time I found precipitated a rediſh ſediment, which being dryed with the aforeſaid Acids did make an Ebullition.

I then forthwith made tryal with the ſame Acid ſpirits and *vitriol* of *Iron* or ſalt of Steel. Upon a little vitriol of Iron I inſtilled a few drops of ſpirit of Nitre, and an ebullition with froth and fumes did ariſe, like as upon the powder left after evaporation, and alſo upon the ſediment of water with ſpirit of Nitre. Upon vitriol of Iron I let fall a few drops of ſpirit of Vitriol, but could not perceive any Luctation, either by ebullition, effervescence, exhalation, crepitation, or elevation. But why ſpirit of vitriol ſhould not ferment with vitriol of Iron, and yet ſhould ferment with the powder left after evaporation of this water, when, as I ſaid before, that the ſtrength of this water conſiſts in a vitriol of Iron with a *terra metallica* or Colcothar adjoyned to, and precipitated with it; the reaſon is plain. In the making of *ſal Chalybis* or vitriol of Iron with oyl of vitriol and fileings of Steel, the oyl doth incorporate with the Steel or Iron; and being a ſtrong Acid, and indeed the moſt Cauſtick part of Vitriol (and improperly called Oyl) doth ferment with the Alkalizate parts of Iron; and from the combining of theſe two different Salts a *neutrum quid*, viz. *vitriolum Martis* comes. Now the pores of Iron being fully ſaturated with the Acid of Vitriol, upon a new inſtillation of more ſpirit or oyl no fermentation follows; ſeeing the iron hath already as it were imbibed as much of the Vitriol as it can, there will not follow any fermentation. For as Water worketh not upon Water, ſo neither ſpirit of Vitriol on ſpirit of Vitriol, the ſame thing worketh not upon it ſelf: neither can the oyl or ſpirit work again on the Alkalizate parts of *Mars*, which are already ſubdued by the Acid of vitriol, and utterly uncapable of making a new conflict with it; but will with ſpirit of Nitre being a ſubalkalizate Acid, becauſe the pores of *ſal Chalybis* are open to it. But why then ſpirit of vitriol ſhould make an Ebullition with the powder left after evaporation, and upon the ſediment, is, becauſe the metallick particles brought from the Marcaſites of Iron are not fully ſaturated with the Eſurine Acids in the water, which preyed upon the Marcaſites, and brought with it fragments thereof; whoſe pores are ſtill ſo diſpoſed, that Acids may be able to cloſe, and by their violent motion divide and as it were tear in pieces, until the contrary ſalts have embraced each other, and are united into a *Tertium Quid* or indiſſolvable Texture.

For a farther compariſon betwixt this Spring-water and a ſolution of Vitriol of Iron I took a quantity of Milk, but by mixing with this Spring-water could find no coagulation, either with hot, cold, or boiling Milk. Then I made a ſolution of *ſal chalybis* with fair water, and mixed it with cold milk;

with milk warm from the cow, and alſo boyled it with Milk; but neither of them curdled, yea no more than fair Spring-water and milk.

But now it may be Queried, What is become of the Acid, *viz.* the Eſurine acidity? And how comes a Solution of vitriol of Iron not to curdle Milk, when as oyl of vitriol goeth into its compoſition, which is an Acid; and like other Acids as Vinegar, *Aqua fortis, &c.* will curdle Milk?

Anſw. The Eſurine ſalt of the Earth preying upon the Metallick parts of the Marcaſites of Iron, ſo alſo the oyl or ſpirit of vitriol in making *Sal Chalybis* on the Iron or Steel; and the vitriol on the oyl of *Tartar* in making *Tartarum vitriolatum*, viz. an Acid upon an Alkalizate body. When they are in a proportionate quantity the conflict betwixt theſe contrary Salts is great, but the Acid being in a proportionate quantity cannot tear in pieces and ſhiver the Alkalizate into inviſible Atoms, but fixeth its points in the pores of the Alkalizate Matter; yet hath not power to ſhatter it all to pieces, and free it ſelf from Combinations: but the Parts of the Acid lie ſheathed and loaded with the Alkali. So they being cloſed together, do by their own weight (eſpecially after the Liquor buoying them up is weakened by Evaporation) fall down to the bottom: and by their mutual conflict or ferment having broken off and dulled the edges of each others Particles, and combined together, do become a *Neutral* Salt.

Some Authors have aſſerted, That from a *Tartarum vitriolatum* put into a Retort, by the force of fire may be drawn off a ſpirit of vitriol again: as if the Salts claſping together had not as it were deſtroyed each others priſtine texture of parts, by breaking off and dulling the edges of the ſaline Particles. Nevertheleſs Experience proveth, That what is drawn over the Helm from *Tartarum vitriolatum*, is not a ſpirit like the oyl or ſpirit of vitriol at the firſt. For the Taſte and Operation of it plainly ſheweth, that the *Alkalizate* ſalt of *Tartar* hath almoſt wholly taken off its Acidity; yea I think I might poſitively affirm, That it is an impoſſibility from theſe Neutral Salts, ſuch as *Tartarum vitriolatum*, *vitriolum Martis*, &c. to reſtore an Acid to its priſtine luſtre and efficacy.

I ſaid before, when the Acid and Alkalizate Bodies are mixed in a proportionate quantity together: For the Acid in too great a quantity diſſolves and deſtroys all theſe *Coagula* that it made with the *Alkali*, when mixed in a ſmall quantity. Whilſt theſe Contraries are proportionate, the *Alkalizate* Particles maintained their part againſt the Acid, ſo that both lay fixed and free from motion, but by addition of more Acid its ſtrength is increaſed, ſo as to ſcatter and diſſolve the Coagulation. And this may be ſeen, as I intimated before, by inſtillation of ſpirit of Vitriol upon this *Spaw-water* or a Solution of *ſal Chalybis* with Galls; wherein the vitrioline parts of the Water with the Galls make *coagula*, but by addition of more ſpirit of vitriol or other Acid are ſcattered, that the Liquor becomes again clear. The ſame reaſon is, when the *Alkali* is too ſtrong for the Acid; it deſtroys and expells the acid particles floating in the Liquor, and maketh them unable to bear up a conflict. So alſo when Milk is curdled by an Acid, the Acid hath entered the Cheeſy part, and loſt its motion; but upon the pouring on of more Acid the Cheeſy part will be precipitated, but at laſt the Coagulation will diſſolve away, and quite diſappear. Many Inſtances I might produce, which I ſhall paſs by, ſeeing they allow the ſame *Rationale*.

As in the making of *Tartarum vitriolatum* the Salts combine, and work themſelves into a Neutral Salt ſo alſo in this Spring-water; where by an Eſurine acid Salt acuating the Water is made a Solution of the *Minera* of Iron, whoſe *Alkalizate* parts combined and claſped with the Eſurine acid Salt, are become a *Neutral*. Upon the inſtillation of a contrary Salt, whether volatile or fixed *Alkali*, the Salts preſently make an aſſault upon each other, and by their cloſing together and taking off their edges by the ferment become a *third* or *Neutral* Salt, In the conflict or duel they thruſt forth and partly leave the Mineral body diſſolved by the Eſurine Acid: which precipitates to the bottom, and carrieth down with it ſome of the Salts of the *Menſtruum.* For more than a *Colcothar* muſt be here ſeparated, becauſe of the ebullition following an inſtillation of Acids thereon.

But leaſt that it ſhould be imagined, that there may follow a fermentation by inſtillation of Acids, becauſe of the *Alkali* added to make a Precipitation, but not belonging to it as a Mineral Water; we muſt conſider, that a precipitation may be made (beſides that by droping thereon or mixing contrary Salts) out of mineral Water three ways: 1. by expoſing to the air (which cauſeth a putrefactive ferment) the Mineral parts will ſubſide; 2. by heat, as in boiling, diſtilling, *&c.* the Ocre falls; 3. by motion *ab extra*, as by carriage, *&c.* The Powder thus precipitated did with Acids make a great ebullition, which could not be from any Salts not belonging to it as a Mineral. Wherefore the Sediment thus precipitated is not a ſimple *Colcothar*, but with the *Colcotar* do fall ſome of the Salts of the *Menſtruum*: for by pouring on freſh water, and dulcifying the Sediment, a Salt is extracted from the *Colcotar*, that may by E-

vaporaton,

vaporation, Chryſtallization, *&c.* be brought to a dry body, and exactly anſwereth *ſal Chalybis* as to its Operation, Experiments, and Effects.

I diſtilled a conſiderable quantity of this Water in a Glaſs Retort and Receiver cloſely luted to it. The firſt Water that came over the Helm I found by taking off the Receiver to be inſipid, which would not with Galls, *Balauſtia* flowers, Avens, Biſtort roots, *&c.* like vitrioline waters ſtrike a Purple. Then I diſtilled off more inſipid Water, but to the ſides of the Retort when cooled I found ſticking a rediſh powder, like that I found by Evaporation; the Reſidue of the Water in the Retort by Evaporation *ad ſiccitatem* yeilded more. Upon this Sediment dryed I let fall a few drops of ſpirit of *Nitre*, of *Vitriol*, oyl of *Sulphur per Campanam*, and *Aqua fortis*; an ebullition with a great effervefcence did immediately follow. But upon inſtillation of oyl of *Tartar per Deliquium*, ſpirit of *Harts-horn*, or other *Alkalizate* Liquors, not the leaſt ebullition or effervefcence could be perceived. From which Experiments, as alſo from the former, may follow theſe two collateral Concluſions.

Firſt, That this *Spaw* like other Mineral Waters by the precipitation of its Ocre or Sediment doth loſe its tinging Property with Galls, and alſo is weakened in its Operation. And although ſome of the Salt yet remain diſſolved in the Water after the falling of the Sediment, its former vigour and efficacy is decayed; for by ſo much the Water hath let fall of its Ocre and Sediment, (which as I proved before is not a ſimple metallick earth, but doth carry down with it ſome of the ſalts of the *Menſtruum*) by ſo much the water is weakened, and by the falling of more Sediment groweth weaker and weaker in its Operation.

Secondly, from the ebullition and efferveſcence of Acids poured upon this Powder left after Evaporation, or precipitated by Motion, Heat, or Air; but upon inſtilling of oyl of *Tartar* or other *Alkalizate* Salts no fermentation follows; I conclude, that the Salt in this Powder is rather Lixivial than Acid: although it be (as I have hinted before) a *Neutral* Salt from the combining of the Eſurine Acid in the Water and the *Alkalizate* part of Iron, yet like *Tartarum vitriolatum*, or *vitriolum Martis*, it inclineth much to an *Alkali*.

And whereas an Ebullition and Efferveſcence followed the inſtillation of Acids on the precipitated Sediment, like as upon vitriol of Iron, or Tartar vitriolated, *&c.* and that an efferveſcence and ebullition follows the pouring of oyl of Vitriol on filings of *Mars* in the making of *ſal chalybis*, and the oyl of Vitriol upon the Tartar in making *Tartarum vitriolatum*; both which Compoſitions like the ſediment of this Spaw will ſtrongly ferment with *Acids*; I conclude it is highly probable, that this Spring, when firſt it becomes a Mineral water, (which is whilſt the Eſurine Acid preyeth on the *minera* of Iron) is hot: but by long running through a Colander of earth or gravel loſeth its heat, and becometh almoſt a cold Spring. Almoſt I ſaid, for by comparing the water of this Spaw with other ordinary Spring-water, but eſpecially with a Rock-ſpring, a ſenſible warmth may be diſcerned. And that the Efferveſcence is ſcarce over at the Spring-head, may be gathered from the Sparkling of the Water in a glaſs, like bottled Sider newly emptied: and, as I have it by good information, doth much reſemble the *German* Spaw-water ſealed up in bottles, and brought to *Leyden* and ſeveral places in the *Low-countries*.

I took about a Pint of *Ilmington* Spaw-water freſh from the Spring-head, into which I let fall a few drops of Oyl of *Tartar per Deliquium*, which made a white Coagulation diſperſed through the whole body; but ſo ſmall, that it was ſcarce diſcernable. I then made a Solution of *ſal chalybis* with fair water, upon which I droped ſome oyl of *Tartar*, and found a Coagulation in it exactly like the Spaw-water with oyl of *Tartar*, The *coagula* in both by an addition of ſpirit of Vitriol were diſperſed, but by *Alkali's* were reduced &c.

Now it may be queſtioned, How come *Alkali* Salts, as oyl of *Tartar*, &c. to make theſe Coagulum's, when as ſpirit of Vitriol or other Acids cauſe no Alteration?

Anſw. There are two ſorts of ordinary *Menſtruums* for Bodies; Ordinary I ſay, becauſe I muſt except *Paracelſus*'s *Sal circulatum*, aud *Helmont*'s Liquor *Alkaheſt*, the grand Solvents of Bodies into their firſt Principles.

Firſt, *Menſtruums* impregnated with acid Spirits or Salts, whether they be Natural Acids, ſuch as the Juice of Crabs, the ſowr juice of Plants, the Acid of Marcaſites of Iron, Alum, *&c.* or Artificially made from natural Salts, as ſpirit of Vitriol, ſp. of Sulphur *per campanam*, &c.

Secondly, *Menſtruums* endowed with *Alkalizate* Salts, either fixed *Alkali s*, as ſalt of Tartar, Wormwood, *&c.* or volatile, as ſpirit of Urine, Harts-horn, or of the horns and hoofs of Animals, Sage, *&c.*

Some add a Third ſort of Menſtruum, *viz.* a *vinous Spirit*, which is the common Menſtruum for making of Tinctures and Extracts, becauſe it is apt to imbibe the ſulphureous Principle from Compounds. But for my part, I take a *vinous Spirit* not as a diſtinct Menſtruum from the two former. For ſpirit of Wine is nothing but an oyl highly advanced by its volatile Salt, with a ſmall quantity of Phlegm. The quantity of oyl is manifeſt by its inflammability, for good rectified ſpirit of Wine once kindled will almoſt totally conſume. In Diſtillation the volatile Salt implexed in the ſulphureous parts ſtriving to get free, doth tear and divide them, until they be rarified into a Spirit: to which is added a little phlegm, for the better ſeperation of the Salts fermenting and exalting the oyl. Now chiefly for its volatile Salt, ſpirit of Wine is the Menſtruum in making the Tinctures and Extracts of *Senna*, *Rhubarb*, *Aloes*, *Mirrh*, *Saffron*, *Hellebore*, and of all dry Roots, Seeds, Flowers, Woods, and Barks. For by addition of volatile Salts the Extracts are ſtronger, than when made with ſpirit of Wine only.

Having this premiſed, I may return to the Queſtion thus; That upon the mixture of Acid and *Alkalizate* Salts they ferment and cloſe together in a Neutral Salt, (as I have already intimated) and forſake or rather thruſt forth the Metalline Body diſſolved and buoyed up in the Menſtruum, which with ſome of the Salts of the Liquor falls down to the bottom. The Salts combined together and floating up and down in the Menſtruum, with ſome of the Mineral body as yet unprecipitated do repreſent theſe *Coagula*: even as oyl of Tartar poured upon a ſolution of Vitriol made with fair Water, cauſeth a ſeparation of the Metalline and Colcotarine Parts ſubſiding to the bottom, and Coagulums of the contrary Salts for a time buoyed up in the Menſtruum. So oyl of *Tartar* with *Ilmington* Water maketh a white *Coagulum*, becauſe it combineth with the Eſurine Acid of the Water. But the Curdling is very ſmall, becauſe of the ſmall quantity of Acid that doth free, and as it were unſheath it ſelf from the *minera* of Iron; or is yet lodged in the pores of the Water, and is not as yet fixed and joyned to the *Alkalizate* part of Iron,

To try what figure the Salt bore that was contained in this Water, I took about two or three Gallons of the Water, and evaporated it *ad ſiccitatem*. At the bottom and ſides of the veſſel I found a rediſh white Powder, which I dulcified with warm Water: And there was left behind an inſipid Earth like red Ocre or Colcotar. The Water I filtred, evaporated, and then ſet to chryſtallize, which yeilded a Salt of an irregular figure: it was of a paliſh colour, but as to its operation anſwered vitriol of Iron.

It being aſſerted by ſome Authors (but the Truth thereof I much queſtion) That many Mineral Waters will looſe in Weight by carriage, by loſs of Spirits as They ſay; or rather (if at all) I ſuppoſe by an *Aporrhea Mineralis*: I filled a glaſs bottle with this Spaw-Water, and ſtoped it up cloſe at the Spring-head, where *I* weighed it with an exact pair of Scales. After four or five Miles carriage

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I tryed and found it continue the ſame weight. After it had ſtood a day or two, by examination I found the weight not at all diminiſhed: ſo that by this way, nor by Diſtillation could I find any volatile ſpirits, wherein the vertue of this Water conſiſts.

The Bottle thus ſtoped I kept for a fortnight, and then could perceive the Sediment juſt begin to fall to the bottom. But in another Bottle carried with This, and left open to the air, I found great part of the Sediment fallen in twelve hours. Which confirms my former Aſſertion, *viz.* That not only Heat, Motion by carriage, *&c.* but the Air alſo precipitates its Sediment.

Upon Tryal I found, that the Water out of which the Ocre was fallen, would not tinge with Galls; but the Water kept cloſe ſtoped for a fortnight did with Galls readily ſtrike a Purple, and ſo would more or leſs, until the *Terra Metallica* was all fallen.

To ſum up then that which hath been laid down, I may ſay of this Spring, as *Helmont* ſaid of the *German* Spaws, *Pawhont* and *Savenir*. *Diſtillavi aliquando ſerio Savenirium & Pauhonteum, & ſanè non tantum mineralium catalogum, imò nil quicquam in iis offendi præter Aquam fontanam & vitriolum ferri.* Helm. *paradox. Quar. de aq. Spad.* So in this Spring the Acid Salt, with which the Water is impregnated, doth in its paſſage through the ſubterreſtrial channels meet with a *Minera* of Iron, which it partly diſſolves, and bringeth along by its Current to the Spring-head. And by a Fermentation betwixt the Eſurine Acid and the Metalline Parts of the *Minera* is made a *vitriolum Martis*; which giveth the vertue to this Spring.

PART III. Sec. I.

HAving made an Hydrological Eſſay as to the Eſſential part of this Spaw-water, I think it not amiſs to ſpeak ſomething as to its Vertue, ſeeing Multitudes reſort to the Fountain, and eſpecially the Poorer ſort guided by a *Hear-ſay*, who drink it as a *Catholicon* or Sovereign medicine for all Diſtempers, not regarding the original of its Source, or what Mineral Ingredients are contained therein.

We are told by the Learned Dr. *Willis*, That by the means of Ferments we are born, bred up. decay and die; that Diſeaſes thence take their Original, and the Reſtoration of Health is owing thereto. *Nec tantùm ratione Fermentorum naſcimur & nutrimur, ſed & morimur: quilibet morbus virtute fermenti cujuſdam ſuas excitat tragœdias.* And a little after, *Quin & morborum curationes fermentationis ope molimur.* Will. *de ferm. cap.* 5. I ſhall therefore only ſpeak ſomewhat of the Natural ferments of our Bodies, and their Depravations, in order to my preſent buſineſs; but for a large account of them ſhall refer the Candid Reader to *Willis*, *Helmont*, *Sylvius*, and other eminent Authors that have fully handled that ſubject, brevity here being only intended,

As for the Notion of Fermentation take this Definition. *Fermentation is an inteſtine motion of the Parts or Principles of a Body, with an Inclination to its Perfection or to its Change.* By Change may be underſtood its Deſtruction, or Diſſolution of its *Compages*, or *mutatio in quid aliud.*

Upon conſideration that an entire Function or Office of every Part in the Body is the Effect or Product of *Health*, and that a *Diſeaſe* is an Ill Conſtitution cauſing an impediment to the Parts in their Function or Office, ſome according to the diverſity of Functions have made a diviſion of Diſtempers.

The Functions do either reſpect the Conſervation of the Individual, or the Propagation of the Species. Theſe that reſpect the Conſervation of the Individual, are either *Natural*, ſuch as Concoction of Aliments, Sanguification, Secretion of Excrements, Production of Vital Spirits, *&c.* or elſe *Animal*, which do reſpect the Senſitive part of the Creature, as in its External or Internal Senſes.

Theſe that reſpect the Propagation of the Species are peculiar to the Male or Female Sex, and accordingly Authors have grounded their Diſtinctions.

I ſhall not proceed in this method, but rather take a Summulary of Diſtempers (ſufficient for my preſent purpoſe) from the Ferments, or rather from the Depravations of them in our body, knowing that a large Explanation would raiſe a Tractate to a large Volume.

Whereas the ingenious *Franciſcus De le boe Sylvius* hath laid down the *Dyſcraſia* of the *Lympha*, and of the *Bilis* for the two ſole Cauſes of Fevers either Intermittent or Continual, (under *Lympha* he comprehendeth *Succus Pancreaticus* and *Saliva*) and aſcribeth Chylification chiefly to the Salt in Spittle, which by Maſtication is mixed with the Aliment or is already conveyed into the ſtomach, but alloweth of no ſtomachical Ferment, I cannot aſſent to be his Proſelyte. For conſidering the ſtructure of the ſtomach, how that its interior or nervous tunicle hath a *Cruſta villoſa* or hairy ſcurf with a multitude of Glandules to percolate and imbibe the Liquors derived from the Arteries and Nerves; we may well ſuppoſe an acid Ferment either implanted in, or derived to the ſtomach from the ſame veſſels that the *Saliva* is. Beſides this, *Gliſſon*, *Willis*, *Diemerbroeck*, yea authors both ancient and modern afford us reaſons all-ſufficient to believe a ſtomachical Ferment.

But ſuppoſing an acid Ferment in the ſtomach, or elſe in the Spittle and ſo the ſtomach to be only as a convenient Work-houſe; it will be all one in a manner, as to the Original and Cures of Diſeaſes that ariſe from the Depravation of the primary Ferment.

It will be too tedious and beyond my intention to deſcribe the Modes of Fermentations in humane bodies, I ſhall therefore content my ſelf to enquire, 1. What are the Fermental Digeſtions of our bodies, and the Depravations of them; 2. The Diſtempers thence ariſing; 3. Whether this *Ilmington* Spaw will contribute to the Reſtoration or Cure of the diſordered Digeſtions.

The Aliment in its way to Nutrition doth undergo ſeveral alterations by the Ferments of our bodies, it is ſeveral times percolated and as it were ſtrained and purged from its *fæces*, after the Changes it hath received, before the Animal ſpirits, the Inſtrument of Senſation, and the chief vehicle of the Soul, are elaborated therefrom.

There are three Principal Digeſtions, *viz. Chylification*, *Sanguification*, and *Production of Animal Spirits*. Beſides, there are others appropriated to particular parts, ſuch as that of the Spleen, Seminal veſſels and Prolifick parts, the fermental Digeſtions of every particular Part, by which it turneth the Nutritive juice into its own likeneſs, as the ſaline and tartareous part of the Aliment into Bones, the ſulphureous and oyly into Fat, the more temperate and balſamick parts (the ſaline and ſulphureous being equally mixed) into Fleſh, *&c.* To which according to ſome may be added the Ferment of the Reins for ſecretion of the *Serum*; a Ferment of the *Glandulæ Renales*; and alſo in the Liver for a ſecretion of the *Bilis*, and ſerous Liquor through the Lymphe-ducts.

The Ferment of the Renal Glandules is only ſuppoſed and conjectural; That of the Liver for ſeparation of the Choler, and that of the Kidneys for ſeparating the ſerous humor may with good reaſon be believed to be conjectural and fictitious. For when the blood is rightly fermented and in its lax *Compages*, the Liver is ſufficient without any innate ferment to tranſcolate the Choler through its Glandulous Subſtance, as *Malpighius de Hep.* hath Obſerved. So alſo are the Kidneys by the Obſervations of *Bellinus de Ren:* without any ſpecifick ferment; yea any more then is peculiar to the blood in its Natural *Craſis.*

Chylification I conceive to be chiefly from the Ferment of the Stomach, although other Things concur thereto. How Chylification is performed *Diemerbroeck Anat. Corp. Hum. Lib.* 1. *Cap.* 6. hath excellently well deſcribed. Which in ſhort is thus.

The Meat whilſt maſticated doth inbibe the

Saliva or Spittle, which not only ſoftens but impregnates the Meat with a Fermentative Quality (that is chiefly by the Salt therein contained) Unto which concureth the Drinks often endowed with acrimonious fermentative Particles. The Stomack receiveth and by contraction of its Fibres cloſely embraceth the meat thus prepared, and communicateth the fermentative juices from the Coat of the Stomack; to which do concur the Reliques left after former Digeſtions, which by ſtaying in the Stomack like an old Leaven are brought to an Acidity. The Acid Particles excited by the Heat of the Stomack and adjacent parts do enter the Pores of the Aliment, and ferment with its Saline and Spirituous Parts, until it be diſſolved and eliquated into Milky Cream or Chyle: which by Contraction of the Stomachical fibres is ſent through the *Pylorus* into the Guts, where it receiveth another Ferment by the mixture of the *Bilis* and *Succus Pancreaticus*; by which the thinner Parts are ſeparated from the thicker and received or rather ſqueezed by the Periſtaltick Motion into the Orifices of the Lacteal Veſſels, but the thicker and groſs ejected by Stool. This Precipitation and Separation *Sylvius* compareth to a Solution of Vitriol in fair Water, which by the mixture of Salt of Tartar, preſently leteth its Sulphureous and dreggy Parts ſubſide.

I ſhall not then like ſome take the perfecting of Chylification in the Inteſtines to be a ſecond Digeſtion diſtinct from the former; but rather a Perfection and Depuration of the concocted Aliment or Chyle. Neither ſhall I make that little alteration or rather preparation to Sanguification, which the Chyle by mixture of the *Lympha* receiveth from the Meſenterical Glandules and *Ductus Thoracicus* before its ingreſs into the jugular Veins to be a third Digeſtion, and diſtinct from Chylification and Sanguification, but as a Preparative to the Latter with a convenient Vehicle.

The acrimonious Particles of the *Saliva* ſwallowed, and the Acid Stomachical Ferment, and the Reliques of Aliment of former Digeſtions ſticking to the Coats of the Stomack and brought to Acidity, finding no Aliment to prey upon, do moleſt and irritate the Stomack; which moleſtation being impreſt upon the Nerves of the Sixt, or according to Dr. *Willis* the Eighth Pair; and by theſe communicated to the Brain, doth excite a deſire of Eating or Hungering after Meat, to imbibe the ferment gnawing on the Stomack.

As for the Colour of the Chyle; or why Mutton, Beef, Bread, Herbs, *&c.* eaten together ſhould be turned into a white Creamy Subſtance. Or why the Aliment ſhould not retain its priſtine Colour, I conceive to be as thus. The Saline and Sulphureous Particles with which our uſual Aliment doth abound, being well diſſolved and mixed together, do by the Acid Ferment acquire a white Colour. Even as in making of *Lac Sulphuris*, the *Flos Sulphuris* and Salt of *Tartar* by boyling together turn the Water to a dark Red, but by inſtillation of Vinegar turneth to a white. So every Liquid impregnated with a Sulphur and an Alkalizate Salt, but more eſpecially when the Salt is volatile; or with a Salt well implexed in, and diſſolved with the Sulphur, by addition of an acid Liquor becometh white, as may be ſeen in the making of Reſinous Extracts of Vegetables, or by mixing ſpirit of Benjamin, ſpirit of Harts-horn, of Soot, or ſuch like ſpirits abounding with volatile Salt, with an acid Liquor or fair Water.

The Chyle having paſſed the Stomach into the Inteſtines, the purer part is received into the Lacteal veſſels, (and perhaps ſome of the more Spirituous parts into the Meſenterical veins, by reaſon of the ſudden refection after eating and drinking by thoſe that are through labour and travel wearied) which convey it to the Meſenterical or *Aſellius* his *Pancreas*; and from thence is conveyed by the *Ductus Thoracicus* into the Subclavian vein, where by the way it is mixed with the *Lympha* brought by the Lympheducts, which is not as an uſeleſs Liquor, but ſerveth for a vehicle to the Chyle, and by its ſaline Particles doth prepare it for Sanguification.

The Chyle having once entered the *ſubclavian* vein is mixed with the recurrent venal blood, and by the *vena cava* is conveyed to the Heart, where is chiefly made the *ſecond Digeſtion* or *Sanguification.* But firſt entering the right ventricle of the Heart, from thence it paſſeth through the *Arteria Pulmonaris* called alſo *vena Arterioſa* into the Lungs. From whence it is reduced to the left ventricle of the Heart by the *vena Pulmonaris* or *Arteria venoſa*, in the *Diaſtole* or laxation of the Heart it enters the left Ventricle, but by its Contraction or *Syſtole* is ſent forth into the *Aorta*, and by It is carried to the whole body. But the reſidue after Nutrition is reduced by the veins to the right ventricle of the Heart, from whence again it begineth its Circulation. This is the Natural courſe in adult perſons, but in the *fœtus* or *Embryo* it is ſomething different.

An *Embryo* having not attained to Reſpiration, nor to a perfection of its Lungs, the Blood cannot Circulate as in adult Animals. Wherefore Nature hath provided two veſſels in a *fœtus* that afterward grow obſolete and uſeleſs, *viz.* the *foramen ovale* and *canalis Arterioſus.* The *Foramen Ovale* is placed under the right Auricle of the Heart, and uniteth the *vena cava* to the *vena Pulmonaria.* The Uſe of it is, to carry the Blood that doth not enter the Right ventricle into the *vena Pulmonaria*, that it may enter the left ventricle of the Heart. The *Canalis Arterioſus* uniteth *Arteria Pulmonaris* to the great *Aorta*: whoſe Uſe is, to convey the blood that hath paſſed through the Right ventricle, and is driven by the *Syſtole* into the great *Artery*, ſo that it ſlideth by the left ventricle. By which we may obſerve, That the blood in its Circulation always entereth the Heart, but in an *Embryo* paſſeth through only one ventricle.

I ſaid before that Sanguification is chiefly performed in the Heart: for it may with good reaſon be queſtioned, Whether the Efferveſcence of the blood (the Accenſion, or *flamma vitalis*, as Dr. *Willis* would have it) be from the Heart, or rather from the Fermentation of its contrary Principles, and according to others *Sanguis ſanguificat.*

Dr. *Lower cap.* 2. *de corde.* abſolutely denieth any Ferment to be placed in the Heart. He telleth us, The Heart oweth its Heat to the Blood, and not the Blood to the Heart; yea that the Blood by its heat doth actuate and enliven our bodies, and that Nature hath not beſtowed more heat upon the heart than upon other Muſcles: but it hath a more brisk and lively heat than other parts of the body, becauſe it is in a continual motion, and ſo much ſurrounded with adjacent parts. Neither doth its Action differ from the Action of other Muſcles. And *cap.* 5. he telleth us, The Chyle is turned into blood by the vital ſpirit and other of its active Principles, which from the firſt Mixture with Chyle do work upon it until it be refined, until the ſaline ſulphureous and ſpirituous Particles be ſet at liberty from the feculent, and aſſociated to them of the Blood.

Dr. *Harvey* that exquiſite Searcher into the Generation of Animals ſpeaking of the Order of Generation of the Parts of the Body, ſaith *Ab initio Punctum rubrum ſaliens, veſicula pulſans fibræque inde deductæ ſanguinem in ſe complectentes &c. Exercit.* 50. That a red beating Spot or Bladder with Fibres thence deduced containing Blood do firſt of all appear. And by exact obſervation doth conclude, In the generation of Animals blood is the firſt thing that is made. And as Pulſation doth begin in it, and from it; ſo at the laſt moment of life doth it end in the Blood. *Quantum ex accuratâ inſpectione diſcernere licuit, fit Sanguis, antequam punctum ſaliens efformatur; idemque calore vitali præditus eſt, priuſquam per pulſum cietur: atque ut in illo & ab illo Pulſatio incipit, ita tandem in ultimo mortis articulo, in eodem deſinit.* Which I ſuppoſe gave occaſion to Dr. *Gliſſon* in his *Anat. Hep. Cap.* 35. to aſſert, That the blood was generated and moved by the heart, but the heart and blood were originally by the Vivifick ſpirit or juice, which remaineth in the blood after its firſt production, and is the cauſe of its future generation: ſeeing that the Womb by its heat doth excite the Vivifick Spirit of the Seed, and put it in action, which frameth the Seminal Matter into the ſtructure of an Animal. So that the *Quickening* Spirit making the firſt blood and heart of an *Embryo*, he ſuppoſeth it ſtill to perform the ſame office; according to that Axiom, *Idem quà idem, ſemper facit idem.*

Againſt this Opinion *Diemerbroeck Anat. Lib.* 2. *Cap.* 11 doth oppoſe ſeveral Arguments, and endeavoureth a Confutation thereof, and concludeth from his Reaſons, That the Blood is generated after, and by the Heart, and not by the Vivifick ſpirit; which (ſaith he) inhering in all parts of the body, quickens and diſpoſeth them to their proper functions. So that he concludeth of a *Ferment in the Heart.*

The Learned Dr. *Willis* telleth us, *Natura poſuit in corde fermentum, cujus inſtinctu ſeu occurſu ſanguis impetuosè effervеſcit, ac velut in flammam accenſus. de ferment. cap.* 5. And in his Exercitation *de Accenſ. ſang Vitalem ſive flammeam animæ partem in corde & pulmonibus ſedem præcipuam & quaſi imperialem habere putemus.* So that he avoweth, the Ferment of the Heart to be the main Cauſe and Seat of the

Flamma vitalis, or the Soul's vital flame. But whether it be *in rerum naturâ*, may be queſtioned.

Variety of Opinions there are about the Motion of the Heart, the immediate inſtruments of its Motion are agreed upon to be the *Fibres*; but then what ſets theſe *Fibres* in motion, is the τὸ κεινόμενον the main Query or thing ſought after.

Some like Dr. *Lower* ſuppoſe the motion of the heart to depend upon the influx of Animal Spirits into the Nerves and Fibres, which make a Contraction as in other Muſcles. Others ſuppoſe it to depend on the Dilatation of the Blood in the Ventricles of the Heart. Others like *Franciſcus de Le Boe Sylvius* think to go a middle way, and make it depend partly on the Influx of Animal Spirits, and partly on the Dilatation of the Blood. Others to depend on a *Materia Subtilis*, that ſubtile Matter ſuppoſed to be in continual motion, and to move all Bodies more or leſs, according as it hath more free or difficult paſſage through the Pores of them. Others ſuppoſe the heart not to move the blood, neither the heart to be moved by the Animal Spirits, nor by a ſubtile Matter, but by the Vivifick Spirit reſiding in the blood, and is the cauſe of its Generation. But *Maurocordatus* not approving the above-recited Opinions ſuppoſeth the motion of the heart to depend on the reſpiration of the Lungs, and the reſpiration of the Lungs to depend on the motion of the heart; as if the Heart and Lungs did put their help in hand to each others Motion.

To run through each Opinion apart, and to recite the Reaſons laid down for confirmation thereof, would be too tedious and beyond my propoſed Subject. I ſhall therefore lay down ſome Experimental Obſervations as Mathematical *Data*, and ſee what Collateral Concluſions about *Sanguification* and *Motion* of the Heart may be thence deduced.

1. *Obſerv.* I took out the Hearts of two young Puppies about a Fortnight old, and cut off their Nerves to prevent all influx of Animal Spirits, and ſeparated the Coherent Parts. I cut open the Ventricles of one of the Hearts, and let out all the blood therein contained. The Hearts I expoſed to the open Air upon a cold Trencher, which did continue beating with a regular *Syſtole* and *Diaſtole* as long as warmth continued. When their Motion had almoſt ceaſed I breathed upon them, and perceived their motion recruted by the warmth of the breath. When their motion again began to abate, by pouring on warm Water I renewed the ſame. Thus they continued until the Natural Heat was totally expired; which was near upon Three Quarters of an Hour after the firſt expoſing out of the Body to the Air. The like Effect I

found upon the Hearts of Frogs; Tortoiſes and ſeveral young Animals. Yea I cut out the Heart of a young Puppy and of a Frog, and divided them into ſeveral pieces, I obſerved a Motion in a *Syſtole* and *Diaſtole* for ſome Minutes to continue in each part thus ſeparated; and that the pricking them with a Needle did much excite decaying Motion.

2. *Obſerv.* A Girl about Fifteen years of age, by a Pen-knife had an Artery cut aſunder in the Wriſt of her hand. With convenient Applications by a Chyrurgion the Blood was ſtoped, but in his abſence the Girl had plucked off the *Eſchar*; ſo that preſently followed a great effuſion of blood from the Artery. At the return of the Chyrurgion, with whom I was alſo called; I perceived that ſhe had loſt almoſt the whole maſs of Blood of her body. In the time of her bleeding (which was the greateſt part of a Day) her Friends about her had given her Sack and Caudle to keep up her decaying ſtrength. At our coming we found, That which the Artery ſent forth did more reſemble the Caudle then Blood (and ſo it had been for ſome hours by the relation of her Attendants) for it was ſo pale and watery, that it would not ting a Handcherchief red. Her Pulſe notwithſtanding had ſmall remiſſion. I adminiſtered to her Cordials with Spirits to buoy up declining Nature; but before the Chyrurgion

ſtoped the Blood, ſhe died: which was about One Quarter of an Hour after our arriving thither.

To this I may adjoyn a like obſervation related by Dr. *Lower*, *de Cord. motu*, *cap.* 2. the Sum is thus. " A Youth about ſixteen years 'old bled for two days without intermiſſion ' or ceaſing. [The occaſion of it is not mentioned-] His attendants and friends gave him 'broth to refreſh and recruit his Vitals, which 'he eagerly ſupped down. His flux of blood 'now and then thereby increaſed, but at 'length the whole Maſs was almoſt evacuated. 'That which run out was pale and watery, neither of the Colour nor Nature of blood, but 'was more like the Broth adminiſtred, which 'he drank much of. The flux ſo continued 'for a day or two, but the Heart in the mean 'time retained its Pulſation. At laſt the flux 'was ſtoped, the Party recovered his health, 'and became a ſtout ſtrong fellow. This he relateth from a Phyſitian of Credit.

3. *Obſerv.* Dr. *Lower* in the forecited Chapter giveth us an Experiment of his own. He " drew out of the jugular vein of a Dog 'about half of his blood, injecting the like 'quantity of Ale and Wine mixed into his 'Crural vein. This he continued by turns 'until a paler tincture inſtead of the blood iſ'ſued out of the vein, like water wherein 'fleſh hath been waſhed, or like Claret diluted 'with much water.

4. *Obſerv.* I ſhall in the next place lay down the Obſervation of Dr. *Harvey*, *de gen. Anim. Exerc.* 16. The *Bulla* or *Punctum ſaliens* (which ſaith he maketh the Heart) is made before the Brain, that elaborateth the Animal Spirits. The ſame alſo doth *Langly Obſ. gen. Anim.* affirm, and common Experience teacheth it. So that although it be queſtioned, Whether or no the Blood be formed before the Heart, yet it is certain that the *Bulla ſaliens* is formed before the Brain.

From which Experimental Obſervations I ſhall gather theſe Concluſions.

Firſt, the motion of the Heart *in fieri* cannot proceed from an influx of Animal ſpirits. For the *punctum ſaliens*, which is the Heart *in fieri*, hath its motion before either Brain or Nerves are framed to elaborate and convey the Animal ſpirits to it, according to the *fourth Obſervation.*

Secondly, neither can the Pulſe be from the Accenſion or Ebullition of blood in the ventricles of the Heart, for according to the *ſecond* and *third Obſervations*, That which came from the Arteries was far enough from Accenſion; being pale and dilute like broth, and (as Dr. *Lower* intimateth) was far from the colour and nature of Blood. From the two Obſervations before cited from Dr. *Lower*, Dr. *Gibſon*, in his *Anat. Hum. Bod. Epitom. l.*2. c. 5. concludeth a full confutation of that

Opinion, *viz. Pulſation is from Ebullition and Accenſion of Blood in the ventricles of the Heart.* Which may be farther denied by the *firſt Obſervation*, for the blood was all poured out of the ventricles of the Puppie's heart, ſo that there was none left to make either Ebullition or Accenſion.

Thirdly, Neither could the Pulſe be from a continued influx of Animal ſpirits from the Brain. For according to the firſt Obſervation, All influx of Spirits was ſtoped; becauſe the Puppie's and Frog's Hearts were cut off from their Nerves, by which the ſpirits do flow, if any at all.

Fourthly, Neither can it be from the Reſpiration of the Lungs; for by the *firſt Obſervation*, the Hearts of them Animals cut off from the Lungs, much more the pieces, did yet continue Beating And in an *Embryo* there is Pulſation of the *Bulla ſaliens* before the Lungs are formed, and long before they have any Reſpiration.

Fifthly, Neither from the impreſſion of Subtile Matter, for that concludeth for a general, but not a particular motion; nor why the Heart ſhould keep a Regular *Syſtole* and *Diaſtole*. Becauſe the ſubtile Matter being in continual motion, would preſs againſt all the fibres at all times; ſo that the Heart would remain either in a *Syſtole*, or a *Diaſtole*. Beſides, as *Diemerbroeck* argueth, This ſubtile Matter would reſtore the motion of the heart whiſt warm, and ſo always recover life in creatures that are ſtrangled-

Sixthly, Neither can it be from the vivifick ſpirit in the blood; for by the *firſt Obſervation*, The Pulſe continued after the blood was poured out of the ventricles, and a ſtop put to all influx of freſh blood. And by *Obſerv*. 2. *and* 3. its proved, That when the whole maſs of blood was almoſt emptied, and the reſt watery and dilute, the heart retained its Pulſe; yet the vivifick ſpirit of the blood muſt have been for the greateſt part evacuated with the blood.

I ſhall now proceed to lay down, what I gueſs to be the genuine cauſe of *Sanguification* and *Motion* of the Heart, although this may be accounted one of Nature's Secrets, and too abſtruſe for Us peremptorily to determine. And *firſt* for Sanguification.

In the begining of Conception, the Spirituous part of the Seed by heat is excited and collected into the *Punctum* or *Bulla ſaliens* from this Spirit as from a Fermentative ſubſtance by the *vis Plaſtica* or *Archeus* are all the Parts of the body deduced. For according to Dr. *Harvey*'s Obſervation, the *Bulla ſaliens* is firſt formed, from which are derived Sanguineous fibres, and one part after another framed, until the whole *Compages* of the Body is perfected. Whether according to the ſentiments of Dr. *Harvey*, the blood be firſt made, and the Heart afterwards for the motion of the Blood, or, according to *Diemerbroeck*, the Heart be made before the firſt Blood, it is not very material. For on both ſides it is concluded, That the *vivifick Spirit* of the *Semen* is the firſt Former either of Blood or Heart. This *Spirit* having got ſome Blood for his Vehicle, and being by Heat ſtirred up and dilated, doth enlarge its Domicile the *Punctum ſaliens*; for being too cloſe pent up doth endeavour for an eruption by particular aſſaults, which is the firſt cauſe of Pulſation. As the Ferment is increaſed by the addition of new Matter from the *Colliquamentum Seminis* at firſt, and other Matter afterwards; ſo the vivifick Spirit doth farther dilate it ſelf in the blood, uutil it hath formed the Veins and Arteries for its Channels, and as a Workman, acccording to the Divine Impreſs ſtamped at firſt by God Almighty on blind Matter, or by the Direction of the *Archeus*, (as *Helmont* calls it, but as for the Name of that Directive Power call it as you pleaſe) hath made every part of the whole Body. This vivifick acrimonious Spirit doth not only forme out of convenient Matter, but alſo inhere in the Parts formed, more or leſs, and giveth to every Part a peculiar Property or *Ferment*, as That of the Stomach for *Chylification*, That of the Heart for *Sanguification*, *&c.*

But ſuppoſe that the firſt blood ſhould be formed before the *Punctum Saliens*, and the Heart contribute nothing thereto. Yet it muſt be granted that Things proceed otherways in Adult Animals, then they do at the firſt formation. As for Inſtance; There is Motion before the Brain or Nerves are formed, yet none now deny that Office to the Brain of elaborating the Animal Spirits that ſerve for Motion. The *Embryo* is nouriſhed and encreaſed before the Stomach and other parts ſerving for Concoction are made; yet after they are made in a perfect *Fœtus* and in adult Perſons, none except through a Spirit of Contradiction will deny them to ſerve for Concoction; ſo that the Heart by his Acrimonious Spirit implanted therein may ſerve for *Sanguification*, which I imagine to be as thus.

So ſoon as the Chyle is mixed with the Blood, the Vital Spirit and other active Principles do work upon the Chyle to aſſimilate it to its own nature. By the Stomachical Ferment the *Salt*, *Sulphur*, and *Spirit* of the Chyle are almoſt ſet at liberty from the groſſer parts of the Aliment; ſo that the Active Principles of the Blood ſoon add to their Exaltation. When the Chyle with the Venal blood is entered the right ventricle of the Heart, the Heart addeth a new Ferment thereto, and ſendeth it into the Lungs, where it reciveth a farther Alteration from the Nitrous Particles of the Air admited by Inſpiration, and intimately there mixed with its *Compages*, where the blood alſo receiveth from the Air its florid Colour: As may be ſeen by ſeveral Experiments of Dr. *Lower's*, and alſo by expoſeing Venal blood to the open Air, for the ſuperficial part next the air will be of a florid Red, but the under part of a Blackiſh colour. Let the blackiſh part be turned to the air, and its *ſuperficies* will be of a light red. In the left ventricle of the heart it receiveth a more perfect mixture, and entereth the *Aorta* under the form of Blood, and is of a Scarlet colour, until the air is tranſpired through the pores of the skin. But Chyle is not perfectly and exactly aſſimilated to the blood, until it hath run through many Circulations.

The moſt ſubtile and acrimonious part of the vivifick ſpirit planted in the heart from its original giveth its Ferment, by which the humors receive an Effervеſcence and Dilatation (if capable thereof) and more or leſs as they are inclinable thereto. Even as Gunpowder that of it ſelf hath no heat, but by fire doth ſoon dilate and hath a great effervеſcence: So doth the blood by the ferment of the heart, and by the dilatation of the blood the ſides of the ventricles of the heart are moleſted, and the fibres of the heart are irritated and provoked to expel the oppreſſing blood. After the expulſion the Heart remains in its

Diaſtole, until by a ſupply of freſh blood there is a new Dilatation and then a *Syſtole.* But to a *Syſtole*, beſides the vivifick Spirit inherent in the Heart, the Animal ſpirits as in other Muſcular motion are called in to help, ſuppoſing a free paſſage; for elſe what meaneth ſo many Nerves derived to the Heart.

The Hearts of Puppies, Frogs, *&c.* cut from their bodies, and the ventricles emptied from blood, will keep (as long as natural warmth) their Pulſation. Becauſe the vivifick acrimonious ſpirit placed in the Heart, by heat is ſet on work to ferment and dilate the blood contained in the Pores and Interſtices of the fleſhy ſubſtance of the Heart, and by irritation of the fibres is made a *Syſtole* and then a *Diaſtole* until the blood contained in the Pores do ſuffer a new Dilatation; to which both vital and Animal ſpirits as yet unſpent, that will make a tremulous motion for ſome time after the death of an Animal, do concur.

The Third principal Fermental *Digeſtion* is That of the Brain, which is well appointed with blood-veſſels, that ſerve as Channels to convey Matter to every part of the *Cerebrum* and *Cerebellum.* Nature hath ſo provided for a ſupply of Matter, That as Dr. *Willis* hath obſerved, *Non modò arterias cum venis, verùm quod rarius & ferè ſingulare eſt, arterias cum arteriis; nempe arterias Carotides unius lateris plu-*

pluribus in locis uniuntur cum carotidibus alterius; inſuper vertebrales utriuſque lateris inter ſeſe & in poſteriores carotidum ramos prius unitos inoſculantur. Anat. Cereb. c. 7. From the blood thus conveyed by the Carotidal and Vertebral arteries, the purer and more ſubtile Spirituous part is carried into the Brain by the winding Meanders of the Arteries, whilſt the Groſſer part is abſorbed and carried back by the Veins, and the *Serum* imbibed by the Glandules and Lympheducts, in order to be reſtored to a freſh Circulation. The manner how the Animal ſpirits are produced Dr. *Willis de ferm. c.* 5. ſheweth by a Similitude. As in making highly rectified ſpirit of Wine with a glaſs Alembick, a Sponge being put into its Pipe, only the moſt ſubtile part can paſs; ſo from the hot rarified blood, only the moſt Subtile ſpirit (as it were diſtilled) can paſs through the Cortical ſubſtance of the Brain. This Liquor thus diſtilled doth obtain a higher degree of perfection, becauſe the Brain abounding with a volatile Salt doth much exalt theſe diſtilled Spirits; ſo that they are as it were endowed with a Ferment, and by their volatile Salt penetrate like Spirit of Harts-horn, more than Spirit of Wine.

* *Carteſius* ſeems to refer it to the *Glandula Pinealis* ſeparating the Spirits from the *Plexus Choroides*. But his Opinion being ſo wide from Truth, as may be ſoon made appear by a

ſcrutiny into the Nature of Glandules, I ſhall paſs it by.

Riolanus would aſcribe it to the ventricles of the Brain; but for a full confutation thereof I ſhall refer the Reader to Dr. *Wepfer*, *de Apoplexia*, only adding this Obſervation of my own.

I was called to a Youth about eight years old, whom I found much complaining of a Heavineſs and Dulneſs of his Head, with a great inclination to ſleep. His head I obſerved to exceed in bigneſs all the other parts in a double proportion. The Diſtemper I found to be a *Hydrocephalus*, and from the Symptoms might eaſily perceive it a fore-runner of death, that did ſoon enſue. I opened his Head, and before ſufficient Teſtimony poured out of the ventricles of the brain near a full Pint and half of clear *Lympha* like Rock water: which would certainly have hindred any generation of Animal ſpirits there, and all Derivation into the Nerves from thence, eſpecially ſeeing his Senſes remained clear, and his head for a long time gradually increaſed. More probable then it is that the Animal ſpirits are elaborated in the Cortical or Aſh-coloured part of the brain, by the ſaline ferment and percolation through the pores of the ſame. So that the Animal ſpirits only by their high exaltation and purification differ from the Vital ſpirits, which latter are the Matter of the former.

Spirits thus elaborated are by others ſucceeding them impelled into the medullous part of the brain or *Corpus calloſum*, where they have a large place to exerciſe the *Phanſy*; in the *Plicæ* of the Brain to lay up *Idea s* for the *Memory*; and in the *Corpora Striata* to exerciſe the *Senſus communis*; and according as they are directed along the Nerves to perform Motion, or as they receive Impreſſions undulating backward to perform the External Senſes.

Probable alſo is the Opinion of *Willis* and *Diemerbroeck*, That there is a *Succus Nervoſus* or Nervous juice, ſerving as a ſpirituous ferment to ſeparate the Nutritive parts from the Blood. As the Blood ſupplieth Matter, ſo the Nervous Juice is as an Active Form in Nutrition. And good Reaſon may be given for this Opinion; for in a *Palſie*, wherein the Nerves are obſtructed, although the Parts are imbued with a conſtant ſupply of warm blood, yet the Parts will fade away for want of Nouriſhment aſſimilated to them, as a ſupply to that which was loſt; becauſe the *ſuccus nervoſus* is wanting, which precipitateth the Nutritive Matter from the reſt of the blood.

Next to the three principal Ferments cometh in That of the Spleen. As for the opinion of Dr. *Gliſſon*, *lib. de Hep. cap.* 45. that the Spleen doth prepare an Alimentary juice that is imbibed by the Nerves, and by them carried up to the Brain, and back again through the Nerves to the parts of the whole body; to me it ſeems irrational; that the ſame juice ſhould be carried to and fro through the ſame veſſels, and that an Acid juice (for ſuch is that of the Spleen) ſhould be ſuppoſed to be a vehicle for the Animal Spirits that are a volatile *Alkali.* The proper Uſe then I imagine as thus.

The Spleen by its Ferment placed therein *ab origine*, doth with the Nervous juice depoſited in the Glandules by the extremities of Nerves terminating in them, cauſe an Acidity in the blood brought by the Arteries. By which Acidity the *Bile* conſiſting much of retorrid lixivial Salt, is haſtened towards a ſeparation, even as by mixture with other *Alkalis* and *Acids* may be ſeen: ſo that the blood reduced from the Spleen by the *Ramus ſplenicus* doth in the Liver ſoon make a Secretion of its Choler.

An Acid Ferment may well be ſuppoſed in the Spleen from its natural ſtructure; which is chiefly made up of membranous Cells like the holes of a Hony-comb, about which the ends of the blood-veſſels are twiſted like the Tendrils of a Vine. Now here the Glandules, as in other parts of the body, may be well ſuppoſed to contain an Acid juice, and may the ſooner impreſs its ferment on the blood by its little ſtay in the cells, before it is carried away with the ſubſequent ſtreams. For a large account hereof I ſhall refer the Reader to *Malpighius de Liene.*

The Seminal parts both in male and female ſeem to be highly endowed with a Ferment; inſomuch that the *Sal*, *Sulphur*, and *Mercury*, are as it were exalted into a noble *Elixir*, from which the *Embryo* taketh its riſe; I mean the *ſemen* in males and the *ova* in females, for both by the ferments of the Genital parts are elaborated out of blood. The manner how is too large for me here to deſcribe, and may be ſeen in ample manner in *Harvey* and *de Graef.*

It is beyond my intention to take upon me here to diſpute, whether or not Milk is made by a bare tranſcolation through the Mammillary Glandules, or by an innate Ferment of the Dugs; or how the *Bile* is ſeparated in the Liver, or whether all the Glandules of our bodies are endowed with a Specifick ferment. But this we may lay down as a Truth, *viz.* That the *Archeus* in the firſt formation hath beſtowed on every Part a peculiar configuration of Pores, and a fermental Digeſtion to receive its proper Aliment, and convert it into a ſimilar ſubſtance to repair that which was loſt, and hath aſſigned a peculiar Office to every particular part.

PART III. SEC. 2.

AS from the fermental *Digeſtions* in their full vigour and luſtre the Organs have that which is requiſite to their functions, and conſequently Health is entire; ſo from their diminution and depravation Diſtempers take their Original. The Concoction of the Stomach and other fermental Digeſtions of the body may ſuffer by the inordinate Uſe of the *Sex Non-naturalia*; but I ſhall take a ſhort ſurvey of Diſeaſes as they are immediately derived from the diſordered Ferments.

The Stomachical Ferment may be vitiated, ſo as to leave a twofold Errour on the Aliment, *viz. Crudity* and *Over-acidity*, which concur to laying the foundation of many Diſtempers. In this ſenſe I mean, *viz.* That All Diſeaſes cannot be immediately derived from This, or the Other particular ferment, but that the Generality of Diſtempers owe their original to the Error of Fermental Digeſtions, the one many times concurring as a Procatartick, and another as a Proximate cauſe.

When the Stomachical ferment is debilitated, the Aliment receives an imperfect

Concoction; whence a *flatus* is excited and a Pain in the Stomach, with an inclination to vomiting and abhorrence of Dyet. If it paſs thus crude through the *Pylorus* into the Inteſtines, it lays a foundation of a *Diarrhœa*, *Worms*, *Obſtruction* of the *Miſentery*, &c.

An Error in the firſt Concoction cannot be corrected in the ſecond; wherefore the crude Alimentary juice being conveyed through the Lacteal and Thoracical veſſels, and ſo away to the Heart, doth cauſe a ſpurious and febrile conflict with the Principles of Sanguification; and according to the quantity of the depraved Aliment, that in 24 or 48 hours *&c* doth riſe *ad turgeſcentiam*, and able to vie (as it were) with the blood, ſo it giveth the difference betwixt Quotidian, Tertian, or Quartan Agues, *&c.* as ſeveral modern Authors have obſerved. And as it is a cauſe of Intermittent, ſo alſo it layeth a foundation of Continual fevers, according as the Principles of the blood by this depraved Ferment become too much exalted. For if the Spirituous part be highly inflamed, then a *febris Synochus* or *Ephemera*; if the Sulphureous part be exalted, or a Putrefaction of Humors in the blood-veſſels, then a Putrid fever; if a contagious *Miaſma* be added, then a Malignant fever, ſuch as the Plague, ſmall Pox, Meaſles, But whether this vitiated Juice be made ſo by the vitiated *Bilis* and *Lympha*, as *Sylvius de* *le boe* would have it, is not to my purpoſe to diſpute.

If the vitiated *Succus Nutritius* arrive to the Brain, and by Obſtruction of the Pores hindereth the Third Digeſtion, *viz.* the elaborating of Animal Spirits, or ſtop their motion, or ſubvert the volatizing Ferment of the Brain, it cauſeth an *Apoplexie*, *Lethargy*, *Coma*, or *Carus*. And according as the Nerves are obſtructed, and the Spirits with their vehicle the *ſuccus Nervoſus* defiled and ſtoped in their paſſage, thence a *Palſie* great or leſs. And as the vitiated juice hath paſſed the Cortical ſubſtance of the Brain, and is confuſed with the Animal ſpirits, ſo as to cauſe an irritation of the Nerves and exploſion of the Animal ſpirits, it cauſeth *Epilepſies*, *Convulſions*, *&c.*

To theſe Diſtempers the depraved Ferment of the Spleen doth contribute; for when the bilious Particles are not evacuated, but by long fermentation become retorrid and groſs, then the Melancholy aduſt terreſtrious blood ſubverteth the refined Texture of the Animal ſpirits, and bringeth on them a mighty gloomineſs, whence *Melancholy Phancies*; and as it impreſſeth its *labes* on the Spirits and *Genus Nervoſum*, ſo it concurreth to *Hypochondriacal* Fits, and many Nervous diſeaſes.

Every part in the body receiving a *Succus Nutritius* from the blood is deprived of its due nouriſhment, when the fermental Digeſtions are deficient, and the Aliment unprepared: inſtead then of aſſimilating the *ſuccus nutritius* to each Part, it being a *ſuccus depravatus* doth inſtead of aſſimilation cauſe *Apoſthumations*, *Tumors*, *Ulcers*, &c.

As the too much debilitated, ſo alſo the too great or over-acidity of the Stomachical ferment will be as a Ground-work for many Enormities. A proportionate Acidity (as I intimated before) is a cauſe of Digeſtion; ſo too great, and eſpecially when alienated from its natural *Craſis*, is a cauſe of Coagulation, Precipitation, and Fixation, and conſequently of Indigeſtion. Beſides the *Appetitus Caninus* cauſed by an exorbitant Acid gnawing the ſtomach; and the *Pica* and *Malacia* from a depraved Ferment, cauſing an inordinate appetite after objects unfit for Aliment, as *Chalk*, *Stones*, &c. a parallel inſtance may be given (of Precipitation, Coagulation, and Fixation of the Aliment by too great acidity of the Ferment,) I mean that of our Cooks *Pickling*, as of *Sampier*, *Cucumbers*, &c. whoſe Pores are filled with the points of the acid Particles fixing themſelves in clammy matter, which put a ſtop to an ingreſs of fermentative Particles from the Air that may tend to the diſſolution of the *Compages*, and ſo are as a coat of Defence from putrefaction. And as the aereous particles are not allowed free paſſage, ſo neither are the fermentative particles of the Stomachical Digeſtion admited to enter, and raiſe a luctation with the active principles of the Aliment, whoſe parts are as it were linked together by the acid particles of the *Pickle*, that the Stomachical ferment cannot tear them in pieces, except when they are taken in a ſmall proportionate quantity, and not able to out-vie That of the primary Digeſtion. A like Inſtance may be taken from ſalted and dryed meats, as *Beef*, *Bacon*, &c. which we find of a hard Digeſtion, and unfit for a weak ſtomach, becauſe its parts are tied together and pores obſtructed by ſaline Particles, and not to be freed and ſet in motion without a Ferment ſtronger than the Coagulation.

And that the Depraved ferment by over-acidity in the primary Digeſtion is a cauſe of many diſorders, yea whilſt in the ſtomach affecting its Orifice cauſeth *Ructatio acida*, *Cardialgia*, *Ardor cum dolore*, &c. may be concluded from their cure by fixed *Alkalis*, as *Sylvius* doth obſerve, whoſe property is to correct and deſtroy an Acid; and therefore in theſe caſes may rationally (beſides Experience proves it) recommend *Coral*, *Crabs-eyes*, *Margarites*, *Chalybis limatura*, &c. *Sylv. de alim. ferm. in ventric. læſâ Prax.med. lib.*1.*c.*7.

This exorbitant Acid ſent into the Inteſtines may (with ſharp vapours excited therefrom

from) cauſe an *Iliack Paſſion*, *Diſenteries*, *Cholick*, &c. But if it be conveyed to the Blood-veſſels, ſo as to paſs the ſtage of the *ſecond Digeſtion*, it doth deſtroy the ſweet Balſamick *Craſis* of the Blood; and by altering its genuine texture doth give occaſion to ſome of its Principles to become too much exalted, and as the ingenious Dr. *Willis*, *de Fermentatione & Febribus* hath proved, doth produce ſeveral Diſeaſes; but its Effects may principally be diſcerned in *Putrid* and *Intermittent Fevers*: The *Phænomena* of which latter *Fran, de le Boe Sylvius de febr.* ingeniouſly ſolveth from a ſpurious acid *ſuccus Pancreaticus* and depraved *Bilis* making ſudden Eruptions into the Inteſtines, and a mutual Conflict with each other, yea when abſorbed by the veſſels into the blood.

Not only the debilitated (as I ſaid before) but alſo the over-acid and vitiated Ferment may concur to the Production of many Diſtempers; for it precipitating the ſweet and well-poiſed Temperament of the Blood, giveth Fluidity to its *Compages*, and from thence an Exaltation of its ſulphureous and ſaline Parts. This *Dyſcraſia ſulphureo-ſalina* and *ſalino-ſulphurea* impreſſed on the Blood and *Genus Nervoſum* giveth Being to the *Scurvy*, which ſheweth it ſelf by its vitiated Ferment in various Dreſſes over the whole body, ſuch as Wearineſs, Dulneſs of Spirits, Spots, Swellings, Aſthma, Change of Urine, flying Pains, ſtinking Breath, Rheumatiſms, Gout, *&c.*

Among the Diſtempers derived from a Pravity in the *ſecond Digeſtion* may be reckoned the *Dropſie*, and not as *Sennertus*, following the footſteps of ancient Phyſitians, laying it upon an ill Conſtitution of the Liver, would have it. For on all hands it being allowed to be from a Non-ſeparation or an Abundance of Serous Humors retained in the body, want of a due Ferment (to the deſtroying of which an exorbitant Acidity will in no ſmall meaſure concur) as well as an Obſtruction in the Veſſels or *viſcera*, may much contribute thereto. For when the Saline and Sulphureous particles are deficient in their due ſtate and proportion, either by want of Aliment, or by conſuming Chronical Diſeaſes, or by a depraved Stomachical Ferment communicating it ſelf to the Alimentary juice received into the blood, or by want of a due acceſs of Air, or by a mixture of heterogeneous things with the Aliment; then the blood becomes too much dilute and watery. As by Obſtructions in the Urinary and other Paſſages, ſo the loſs of a due *Ferment* (as many Caſes might be produced of an *Iſchuria* or Suppreſsion of Urine by a meer defect of Fermentation in order to a Secretion) to lax the Contents in the Blood-veſſels, or rather to make a Secretion, the Urinous *Latex* is not ſeparated from the blood, but regurgitates in its Veſſels, until Nature overburdened layeth it down in the Habit of the body. thence an *Anaſarca*; or in the *Abdomen*, and thence an *Aſcites*; and if with a *flatus* in the Cavity of the lower Region, thence a *Tympanites*.

Beſides the Uſual cauſes of a Conſumption of the Lungs, ſuch as an Ill-conformation of the Breaſt, an Hereditary weakneſs in the Lungs and Inclination, precedent Diſeaſes as *Pleuritis*, *Empyema*, *Variolæ*, &c. obſtruction of the Lympheducts of the Lungs, unwhoſome Air, and acrious Steams, a ſpurious Acidity impreſſed on the Blood and the *Genus Nervoſum* hath no ſmall ſhare; in as much as the Corroding humor will ſoon exulcerate the Lungs, or at leaſt excite the *Diatheſis morboſa* of them.

Beſide the exorbitant Ferment of the Kidneys (if any there be) and their lax *Compages* too much percolating the *Serum* from the Blood, this inordinate Acidity cauſing a too looſe Contexture of Parts, and conſequently too great a Secretion of Serous humors, doth much concur to the foundation of a *Diabetes*. As an *Iſchury* many times doth not ſo much depend on the Stone or Obſtruction of the Urinary veſſels, but on a too ſtrict and faſt *compages* of the blood, when for want of a Saline ferment the Serous parts remain unſeparated; ſo from too much Acidity, too great

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a Secretion, and conſequently a *Diabetes*.

This ſpurious Acidity aſſaulting and combining with the Tartareous recrements of our bodies, doth coagulate into Gravel or Stones commonly in the Urinary paſſages. For all Stony Concretions take their Original either from a viſcous Matter, or ſabulous Earth congealed together by a *Saline Agent*, as *Nitre*, *Alum*, *Sal Gemma*, &c. or by a *Seminal petrifying Juice*, whence many ſtony Concretions take their growth, as *Coral*, *Coralline Moſs*, and many other Marine Concretions. Yea perhaps it might be truly aſſerted, that *Rocks* take their growth from the Plaſtick power of a petrifying Seed.

If this depraved Acidity arrive with the Blood to the Brain, ſo as to cauſe Obſtructions, (which are as Bars to ſtop a generation of freſh Animal Spirits) or to deprave its Ferment, it effecteth a *Coma*, *Lethargy*, *Carus* or *Apoplexie*, according as an acid, ſerous, or otherways vitiated humor hath entered the Brain more or leſs, and the Spirits retire from the outward parts of the Brain, or are incapacitated for Motion. But if a putrid recremental *ſordes* hath entered with, and defiled them Animal ſpirits that are generated, it cauſeth an Exploſion of the *Spirits* until they have ſhaken off the heterogeneous Matter offending, as in an *Epilepſie*, *Convulſions*, *Swoonings*, &c.

If for a Nutritive juice to be conveyed to each part, that by its proper digeſtive Ferment aſſimilateth a convenient matter to repair that which was loſt, a ſowr fretting Humor is advanced in its place; inſtead of Nutrition many Diſeaſes are occaſioned. For the peculiar ferment of each part being hereby depraved That matter which ſhould be Nutritive, will become a ſharp corroſive ſubſtance or humor, as in *Cancers*, *Fiſtulas*, *Ulcers*, *Apoſthumations*, *Leproſies*, *Inflammations*, *Strumas*, *Scabies*, and many other maladies.

If the thus depraved Aliment reach the *Genus Nervoſum*, but not ſo powerfully as to produce a multitude of Infirmities incident to that kind, yet ſufficient to cauſe the *Succus nervoſus* to degenerate from a volatile ſpirituous Ferment into an Acid humor, and by the extremities of the Nerves to be laid down in the *Synodia* of the joints, and the extremities of the Organs, where the nervous fibres end, and it there meeteth with a Tartareous or fixed humor from the blood; the *Gout* taketh its off-ſpring, or at leaſt is excited from a latent hereditary Seed. From the combination of theſe different ſaline humors (even as from ſpirit of Vitriol and oyl of Tartar) cometh white hard Coagulums or Nodings; and by the irritation of the nervous fibres a flux of Humors, and conſequently *Solutio Continui* is the Reſult; whence the Gout,

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attended with his various ſymptoms or wracking Torments, approacheth Championlike almoſt irreſiſtible. The *Gout* Enemy-like having one diſplayed his Colours, how eaſily are its forces increaſed by the eating of Salt-meats, drinking of Acid liquors, and *French* Wines much abounding with a Tartareous Salt: which maketh the aforeſaid Cauſe very probable.

It may be objected, That if a ſpurious Acid or depraved Fermental juice of the *firſt Digeſtion* be thus transferred from the ſtomach through the ſubſequent Digeſtions, as to lay a foundation of ſo many Diſtempers; then from a depraved ſtomachical Ferment, the Diſeaſes reſulting from the ſecond and third Principal, and other peculiar Digeſtions, will all ariſe together, becauſe the ſame depraved Alimentary juice is carried in a very ſmall time through them all.

Anſw. An Error in the firſt Digeſtion being not corrected in the ſecond or ſubſequent, thence it will follow; That an Error in the ſtomachical Ferment will be as a Proximate or at leaſt as a Procatartick Cauſe of many Diſeaſes immediately enſuing the Digeſtions ſubſequent to the firſt. Yet it may not be concluded, that it always concureth as a neceſsary Cauſe. For many times Diſtempers are the very Products of, and are derived from the Depravation of latter Digeſtions, without any previous diſpoſition from the primary Ferment; as the Depraved ferment of Sanguification or Production of Animal Spirits may be no leſs hurtful to our bodies, when it is immediately derived from the Errors of ſubſequent Digeſtions, than when it is laid in the ſtomachical or firſt Ferment.

Thus the Blood wanting a vital Ferment in the Heart and Arteries, or its uſual volatiſing Ferment from the Air, for want of a due Secretion of its recremental *ſordes*, by Obſtructions of the veſſels, want of Perſpiration, and inordinate uſe of the *Sex Non-naturalia*, *&c.* will cauſe *Fevers*, *Scurvies*, or other Diſtempers incident to the blood, when the ſtomachical Ferment may be entire.

The Brain alſo being too lax or weakened by the irregular uſe of the Six *Non-naturalia*, or by the illneſs of them, or otherways having loſt its ſaline volatiſing Ferment, may of it ſelf give occaſion to many Diſtempers incident to the *Genus Nervoſum.*

The Womb in the Female ſex by its peculiar Ferment cauſeth an inturgeſcence of the Uterine blood-veſsels, ſo as to open them, and make a Lunar Evacuation of the ſuperfluous blood; which by the intention of Nature is deſigned for the nouriſhment of the *fœtus*, but if there be no Conception (excepting impediments) then a Menſtrual flux. If the blood-veſsels be obſtructed by groſs humors, or their orifices cloſed by Cold, *&c.* then the ſuperfluous blood ready for Expulſion contracts a violent acrimony, and regurgitates with the circulating blood to the Heart and Brain, whence *Syncopes, Palpitations of the Heart, Faintings, Convulſions, Suffocation of the Lungs,* yea many other Diſtempers according as the Blood and the *Vital* Spirits are tainted, or the *Animal* defiled. Inſtances might be given of an *Epilepſie, Palſie, Tumors, Scurvy,* &c. occaſioned by the ſtopage of the Menſtrual courſe, which ſeem to be from the enormities of the ſecond and third Digeſtion; but the *febris alba* peculiar to this ſex with its uſual ſymptoms plainly illuſtrateth, that the Menſtrual Obſtruction may ill affect the ſecond and third Digeſtion.

Not only in the Female, but alſo in the Male the Spermatick veſsels, exorbitant or deficient in their Ferment, may produce direful diſaſters.

The Spleen by its ferment helpeth to ſublime and exalt the feculent and terreſtrious parts of the blood brought by the Arteries, ſo that by the Splenical ferment the blood returneth in the veins far more pure with its exalted Principles, and fitter to depoſite the the Bile in the Liver. But when the Spleen is ill-affected, the blood either over-fermenteth, as in the Scorbutick and Hypochondriacal diſeaſes; but if obſtructed or Scirrous, the blood is deprived of its due ferment, and thence may occaſion a *Dropſie*, *Cachexie*, &c.

To theſe may be added the depraved ferment of each Part, all-ſufficient to produce Maladies in them, yea when the foregoing Digeſtions are in good plight. But I ſhall not inſiſt thereon, having taken a ſhort Abridgment of moſt of the Diſtempers incident unto our bodies, which may lead me to an Enquiry after the Vertue of this *Ilmington-Spaw*.

PART III. Sec. 3.

AFter a ſhort Curſory of Diſeaſes, I come next to enquire into the Medicinal Uſe of this *Ilmington-Spaw*; and finding it to be a Chalybeat Spring, a little Scrutiny into the Nature and Artificial Preparations of *Mars* will much help to our buſineſs in hand.

Iron by a Chymical *Analyſis* is found to conſiſt of *Salt*, *Sulphur*, and *Earth*, as the three principal Conſtitutive Ingredients, with a ſmall quantity of *Water* and a leſs of *Spirit*. I ſay not, that Theſe are the firſt Principles, (for it like other Metals is derived from Water or a Nutritive *Succus* as a more remote, but Matter indeterminate as the real primary Element) but that They are ſuch which do immediately make up the Body of Iron, and expoſe it as ſuch an Object to our Senſes.

Chalybs or *Steel* doth differ from *Iron* only by Calcination with *Horns*, *Claws*, and *Hoofs* of Animals, or with ſuch like *Alkalis* laid *ſtratum ſuper ſtratum*: Which by their Alkalizate volatile Salts do carry away in Calcination many of the ſoluble parts of Iron, and deſtroy much of its Acidity. So that *Steel* is of a more faſt and hard body, or of a cloſer texture of Parts than *Iron*, and doth much partake of an Alkalizate Salt.

The vertue and operation of *Mars* doth chiefly depend on its Saline and Sulphureous parts, and according as they are more or leſs ſet at liberty from the terreſtrious, ſo a Preparation is more or leſs Medicinal. The uſual Compoſitions are theſe: 1. *Crocus Martis aperitivus cum ſulphure, cum aqua, vel aceto.* 2. *Crocus Martis aſtringens.* 3. *Tinctura Martis.* 4. *Extractum Martis.* 5. *Mars diaphoreticus.* 6. *Vitriolum Martis.*

1. *Crocus Martis aperitivus cum ſulphure* is made by applying a Butt of Brimſtone to a hot Bar of Iron, or by calcining the Filings of Iron with Sulphur in an earthen pot or Crucible. In either way the Acids of Sulphur do penetrate the body of *Mars*, ſo as in the operation to carry off much of the ſulphureous parts of Iron, but by the addition of the acid parts of Sulphur to much increaſe the Saline. Some of the Sulphureous do yet remain, is apparent by the fetid ſavour in Belchings after the taking of this *Crocus*. That the Saline part is increaſed, is clear; becauſe the Weight of the Iron will be increaſed by the Preparation. For Sixteen ounces of good Iron, by weighing after the Operation is

ended, will yield Eighteen or Nineteen (except the Calcination be vehement, which is needleſs) of *Crocus.*

This is an excellent Preparatioa,and worketh good effects upon a twofold account, *viz.* 1. becauſe of its *Sulphur*, 2. its *Salt.* The Sulphur will enrich and add a new ſupply to a cold watery blood, ſo that in the *Febris alba*, *Pica*, and *Leucophlegmatia*, it will reduce the pale-faced Patient to a florid complexion; becauſe of its Salt it is a good Deoppilative, as in Uterine obſtructions and thoſe maladies peculiar to the Female ſex, and in the *Dropſie* may be of good uſe becauſe of its vitriolick Stipticity, that bindeth up the laxity of veſsels and other parts.

In the making of *Crocus Martis cum aceto*, the Sulphureous parts are almoſt ſeparated, inſomuch that after it is ſwallowed down it yieldeth but a weak ſulphureous ſavour. But by addition of the Acid parts of Vinegar, the Saline Principle of *Mars* is ſo much exalted and advanced ſo near an Acid; that by inſtillation of other Acids it will ſcarce make any effervеſcence or ebullition at all, yea weaker than *Crocus cum Sulphure*, that maketh a far leſs ebullition with *Acids* than plain *filings* of *Iron.*

This *Crocus* in the Preparation having loſt much of its Sulphur, is unfit for uſe when the blood is too low, or depauperated in its Balſamick Sulphur; as in diſeaſes proceeding from a wateriſh blood, or from phlegmatick Obſtructions. But where the blood is retorrid or aduſt, this *Crocus cum Aceto* by its Saline Principle being cool and aperient is of good uſe, as in *Hypochondriacal* diſtempers, *Carbuncled* faces, and to aſtringe a laxed blood-veſſel, becauſe of the ſaline ſtiptick Principle implexed in the Terreſtrious.

Crocus Martis cum Aqua is made by expoſing *Plates* or *Filings* of Iron to the *Rain* or *Dew*, until it hath contracted a Ruſt, which collected is called *Crocus Martis cum Aqua*, or *ferri Rubigo.* This *Crocus* conſiſteth of the ſulphureous, ſaline, and terreſtrious parts combined together; yea indeed it is the very ſubſtance of Iron, having its pores much opened by the Diſſolvent or Saline parts of *Water*; which not only maketh its Pores more open, but by combining with it maketh this *Crocus* an excellent Aperient medicine, whoſe Deoppilative vertue chiefly dependeth on this Salt.

The Sulphur of Iron being retained in this Preparation renders it a fit ferment for blood, whoſe active Principles are weak and faint: And the Saline part (being exalted by That of the Diſsolvent *Water* that much laxeth the body of *Mars*) renders it a good Aperient in Obſtructions, as of the Liver, Spleen, Meſentery, Lacteal veſſel, or Womb with its coherent parts.

Crude *filings of Iron* taken inwardly may be diſſolved by the Acid ſtomachical Ferment, as by extraneous Acid Menſtruums, which may be concluded from the fetid ſtrong ſcented Smell, and the blackneſs of their Excrements that take it unprepared. But then it muſt be a ſtrong robuſt Conſtitution, able to bear the Iron in its ſolid ſubſtance; but in Conſtitutions where the acid ſtomachical ferment is weak, there is danger, leſt that the *Filings* ſhould remain undiſſolved and cauſe Obſtructions, or elſe grating on the Tunicles of the Inteſtines cauſe wracking Torments. Beſides, the Sulphureous part of *filings* of *Iron* unprepared will more increaſe the Ferment of the Blood than the Saline ſtiptick can repreſs; which maketh it unfit for Uſe in hot Conſtitutions, or in Diſtempers proceeding from a wracking fiery Blood. And if the Filings of *Iron* be of ſo hard a Diſſolution, much more theſe of *Steel* whoſe ſubſtance is more faſt and compact, and pores more cloſed, that its Diſſolution muſt be more difficult.

2. *Crocus Martis aſtringens* is made by calcining of *Filings* or *Plates* of *Iron* in a ſtrong fire, which carrieth away the ſaline and ſulphureous parts that made it an Aperient medicine. Some waſh the Iron, in order to the Preparation, with fair Water or Vinegar; which not only with frequent Waſhings may carry away much of the droſsy impurities,

but alſo take away or at leaſt deſtroy much of its volatile Salt and ſoluble Parts, that muſt afterwards by the violence of fire have been conſumed or elſe diſpoſed for a ſeparation. The terreſtrious part of the Iron being deprived of the active Principles (for by a ſtrong Calcination thoſe few that remain are become fixed) it imbibeth the ſaline igneous Particles, which remain fixed therein. And being much deprived of its Salt that renders it a Deoppilative, it is become a proper Aſtringent to be uſed in a *Diarrhœa*, *Breaking of a vein*, *Flux of Hæmorrhoids*, *immoderate Lunar evacuation in women*, &c. for beſides the Aſtringency it is endowed with, it will imbibe much of the exorbitant Acidity of our bodies, ſeeing it is deprived much of its Saline principle.

3. *Tinctura Martis*, made with *Ruſt* or *Fileings* of Iron and white *Tartar* boiled together in fair water, is an excellent Aperitive: for beſides the diſſolved *Mars*, the Tartar is alſo a great Aſſiſtant, eſpecially in diſeaſes proceeding from an acid Humor. Whence it may be of good effect in a *Cachexie*, *Dropſie*, *Uterine obſtruction*, and *Hypochondriacal* Diſtempers.

4. *Extractum Martis* made with the phlegm of Honey, juice of the White-wine Grapes throughly brought to maturity, and the juice of Lemons, hath its aperient faculty not only

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from the Iron, but alſo from the ſaline part of the Menſtruum Now this Menſtruum being not very corroſive, doth diſſolve only the ſaline and ſoluble parts of *Mars*, but leaveth the groſs and terreſtrious parts behind. So that the ſaline parts of Iron impregnated with the Eſſential ſalts of the Menſtruum, maketh it a good Opener of Obſtructions, ſuch as thoſe of the Liver, Spleen, Meſentery, or of the other *viſcera* of the *Abdomen.*

5. *Mars Diaphoreticus* made from *Ruſt of Iron* and *Salt Armoniack* ſublimed together into Flowers, which being diſſolved in water will with oyl of *Tartar* or ſpirit of Salt Armoniack be precipitated in form of a Powder called *Mars Diaphoreticus*; which taketh its Sudorifick quality from the volatile penetrating parts of Salt Armoniack, carried with and fixed in the Chalybeat particles in Sublimation. Theſe volatile Salts will ſoon open the Pores of our bodies, eſpecially ſeeing they carry with them Chalybeat Particles all-ſufficient to cut tough viſcous humors obſtructing the Pores or Paſsages.

6. *Vitriolum* or *Sal Martis* is made from the parts of Iron diſsolved in an Acid Menſtruum, ſuch as oyl of *Vitriol*, oyl of *Sulphur*, *Aqua fortis*, &c. but moſt commonly with oyl or ſpirit of Vitriol, which giveth the Denomination to the Compoſition: yet if we

look into the nature of the thing, we may form a like Compoſition of other Acids, with oyl of *Sulphur*, ſpirit of *Nitre*, &c. as well as with oyl or ſpirit of Vitriol, only changing the name into *Mars ſulphuratus* or *Sal Martis cum Sulphure, cum Nitro*, &c. In the making of *Sal Martis* with oyl of Vitriol, and Iron either filed or in its groſs ſubſtance, ſome Chymiſts will add an equal weight of ſpirit of Wine to the oyl of Vitriol, or elſe two pounds of ordinary Water to one pound of good ſpirit of Vitriol. The reaſon of it is, becauſe the ſpirit of Wine by its Alkalizate Salt, or elſe the Water may dilute and weaken the oyl or ſpirit of vitriol, that it may not incorporate with the main body of *Mars*, but with the ſaline and more ſoluble parts; that there may be gained a more pure Salt, freed from moſt of the ſulphureous and terreſtrious parts of Iron. In the Diſsolution the ſaline parts of the Menſtruum do joyn with theſe of *Mars*, and in the mutual conflict of Fermentation they take off and dull the edges of each other, and by combining together become a Neutral Salt.

In this Preparation the ſulphureous and terreſtrious parts of Iron are ſeparated from the ſaline, from which diſsolved in fair water by Evaporation, Chryſtallization, *&c.* is made *ſal Chalybis* or *vitriolum Martis*.

Sal Chalybis being actuated by the Vitriol is of a ſtronger operation againſt Obſtructions than *Crocus Martis*; but for want of the ſulphureous principle of *Mars* will not add ſo ſtrong a Ferment to the blood, and conſequently is not ſo effectual in *Cachexies*, nor againſt Diſeaſes proceeding from a cold watery conſtitution. But where the blood is over-ſermented, where it is either Pontick, acrious, or fiery, and in Obſtructions proceeding from ſuch a Dyſcraſie of the Blood it may be of excellent uſe.

This *Ilmington water* (as I have proved before) doth derive its vertue from an Eſurine Salt preying upon a *Minera* of Iron, which by working upon and combining with each other do become a *vitriolum Martis*. I ſhall then in the next place ſhew more fully as to particulars, wherein this Spring may be ſerviceable to our Country in reſpect of its Medicinal vertue, and then lay down ſome *Cautions* and *Rules* to be obſerved by the Drinkers of this Chalybeat Water.

After a ſhort Account in the foregoing Section of Diſeaſes, how they may be derived from the Depraved digeſtions of our body; I ſhall now conſider, how far this *Ilmington Spring* will conduce to the Reſtoration of the *loſt* or *vitiated* Ferments, and conſequently be a Preſervative for *Health*, or reſtore that which is impaired.

Firſt, the *Scurvy*, being cauſed by a Dyſcraſie of the blood, either when its ſaline or ſulphureous parts are too predominant, may be much corrected or curbed by this Chalybeat Spring: In as much as the Mineral Salt is herein become near a plain *Alkali*, and will penetrate to the *ſecond Digeſtion*, is able to correct the ſowr ſaltiſh Blood. And being freed from the ſulphureous parts of Iron, will much correct the ſulphureo-ſaline Dycraſie, when the blood like Wine is become over-fermented or fretted. This *Spring* being a great *Diuretick*, will help to carry off that which is ſuperfluous, and being a good Aperient in obſtructions of the Spleen may correct its vitiated acid Ferment, that with other Enormities may concur to alter the ſweet balſamick temper of the Blood.

But conſidering that a Crude Digeſtion or ſpurious Acid Ferment of the Stomach doth many times as a Procatartick Cauſe lay a foundation of the Scorbutick Ferment; this Water muſt be aſſiſted with Purgatives to carry off the recremental *Sordes* of the Stomach, and other Digeſtions, (more eſpecially for Cautions hereafter laid down,) and be alſo aſſiſted with ſome peculiar Medicine to reſtore the blood to its ſweet and well-poiſed Temparament, according to the Cauſe from whence the *Dyſcraſie* took its Original: which requireth the Advice of a skilful Phyſician.

Secondly, the Spleen by a Specifick Ferment conduceth to a Secretion of *Bilis*, but if by Obſtruction or Depravation it be deficient in its fermental Operation, the blood not purged from its *ſordes* doth become obſcure and muddy, ſo that the Animal Spirits thence elaborated are neither pure nor refined, but dark and gloomy fit for melancholy Phanſies. From a long ſupply of ſuch feculent blood are the Spirits ſpoiled, and Hypochondriacal Fitts and Melancholy take their growth.

This *Spaw-water*, containing a *vitriolum Martis*, is a good Deoppilative in Splenical obſtructions, for being of a penetrating nature is good for theſe abſtruſe Receſſes. By the Reaction and Combination of the acid ſalt of the Menſtruum with the Alkalizate of *Mars* is made a *Neutral Salt*, but moſt inclining to an Alkali, Whence it may be of good uſe to correct the ſpurious acid Ferment of the Spleen but now communicated to the blood.

By reſtoring the Spleen to his natural Ferment in deſtroying that ſpurious Acidity, by opening Obſtructions, and its Diuretick property carrying off many of the feculent parts, the blood may be freed from the opace Melancholy ſteams that defile the Brain, the workhouſe of Imagination and Judgment, and ſo be reſtored to its natural *Craſis*. But withal obſerve, That this Water muſt be helped with Purgatives to cleanſe the blood from its *fæces*, leſt that inſtead of being an Aperient it ſhould prove to be an Obſtructer, eſpecially in the Extremities of the ſmall Capillary veſſels, where the Blood in its Circulation is hindred by a viſcous dreggy Matter; but beſides Catharticks, where other Digeſtions are deficient in their office, *Specificks* muſt alſo be applied.

Thirdly, the *Dropſie* conſiſteth in a dilute watery blood, or rather in a Non-ſeparation of *Serum* or Urinous *Latex* that regurgitateth into the blood-veſſels, until it be laid down in the Habit of the body, and ſometimes with a *flatus*. The loſs of ſecretion of this *Latex* is frequently from the want of a Ferment in the bood, which chiefly dependeth on the Saline Principle as the main cauſe of laxing the *Compages* of the blood for the ſeparation of Serous Humors. Beſides the loſs of a Ferment, Obſtructions in the Urinous veſſels and Lympheducts many times do lay a foundation to the ſtructure of a *Dropſie*.

Ilmington-Spaw may be uſeful in this caſe upon a threefold Account. 1. Although *ſal Chalybis* be freed from the ſulphureous parts of that Mineral, and conſequently is not (as I ſaid before) proper by it ſelf in *Cachexies* and cold Phlegmatick Diſtempers; yet it doth mightily take off the ſpurious Acidity, and laxeth the too ſtrict *compages* of the blood. And this Salt coming nigh to an Alkali is a great Diuretick, fit to carry off the ſuperabundant Matter. 2. The ſaline Particles with their Edges will cut the viſcous Matter obſtructing the veſſels, which many times put a ſtop ro the *Latex* in its proper Paſſages. 3. It being a Stiptick Medicine may be beneficial to reſtore the debilitated Membranous parts too much laxed by the ſtagnating water. All which Properties do exactly correſpond with the Indications of Cure of the *Dropſie*. Yet we muſt neceſsarily allow *Specificks* and other Medicines *intermixtim* applied, according as the Patient is this or the other way inclined.

But withal take notice, That what is here ſpoken muſt be underſtood of a *Dropſie* in its firſt growth; for otherwiſe the gulping down of three or four Quarts of Water will help to ſwell up the debilitated parts, and add a great Oppreſſion to decaying Nature.

Fourthly, from *Gravel-ſtones* in the Reins and Bladder, and alſo the *Strangury* and *Dyſury* we may be relieved by drinking of this *Spaw-water*, in as much as it will deſtroy that exorbitant Acid combining with the Tartareous recrements into *Gravel-ſtones* in the Urinary Paſsage, and alſo as a Subalkalizate take off that acrimonious Humor which cauſeth a ſharp fretting Urine. Beſides taking off that ſharp Humor, that giveth increaſe to theſe ſtony Concretions and fretting Urine, it being drank in a large quantity, and a great Diuretick, it will keep the Current open and lax the Urinary veſſels, ſo as to carry off much of the feculent Matter, and like a Brook with a Current-ſtream take with it ſome ſandy Concretions, which in our Bodies we call Sliping of a Stone.

Whether or not a *Calculus* may be diſſolved whilſt in the Kidneys or Bladder, is not to my purpoſe here to enquire; for I look upon it to be beyond the vertue not only of This, but of all other Chalybeat Waters.

Fifthly, the *Jaundice* proceeding not only from an Obſtruction of the Hepatick veſſels by tough viſcous Humors, Scirrous Tumors, *&c.* but alſo by the Saline and Sulphureous or Bilious parts of the blood, too much exalted and indiſpoſed for a Separation, but diſperſed over the whole body. As it happeneth frequently after immoderate drinking of Wine or ſtrong Liquors, that too highly ferment the Blood; ſo that the acrious particles remain unſeparated, and ſhew themſelves by a yellow Tincture of the skin.

For the Cure of the *Jaundice* we may have recourſe to this *Spaw*, and that upon account of anſwering theſe two Indications. 1. It opens Obſtructions derived from impediments in the ſecond Digeſtion, and ſo may reduce

the

the Choledochal veſſels to their proper functions. 2. The *Vitrlolum Martis* in this Water by its Stiptick Vitriolick Salt will take off theſe high flown acrious Particles that make too ſtrong a Ferment, and whirl about theſe aduſt Cholerick parts, which by a due ferment and lax *compages* of the blood ſhould have been thence ſeparated.

Sixthly, the Lunar Evacuation of Blood in the female Sex is checked in its natural courſe by Obſtructions in the Uterine Sanguinary veſſels by viſcous tough Humors, Tumors, or when their Orifices are cloſed by Cold, *&c.* The blood ſtopped in this Critical Evacuation doth regurgitate by the veins up again into the body; from whence follows a Depravation of the vital Ferment, and thence frequently a Crudity of Humors cauſing the *Green-ſickneſs*, *Cachexie*, &c. And if by ſtagnating in the veſſels the blood hath acquired a virulent acrimony, ſo as to oppreſs the vital Spirits, then *Syncopes*, *Faintings*, &c. but if it reach the Animal Spirits, then *Epilepſies*, Hyſterical Fits, and ſuch like Diſeaſes will make their Aſſault.

In Diſeaſes thus proceeding (for theſe Diſtempers may alſo otherways take their Riſe, as from paſſions of the Mind Hyſterical Fitts, from loſs or defilements of the Spirits *Lipothymia*, *Syncope*, &c.) *Ilmington-Spaw* is of excellent Uſe. For it will open Obſtructions, abſterge the excremental *ſordes*, and take off the ſpurious Acidity that is many times exorbitant in the blood, and may adhere to the Orifices of the Uterine veſſels, that often cauſeth the *Febris alba* to be of ſo difficult Cure in ſome young women. *Sal Chalybis* being freed from the ſulphureous part of Iron, it will not be amiſs to add ſome *Crocus Martis* or other prepared Medicine, that by its ſulphureous Particles may increaſe the Sanguinary Ferment in *Cachexie*, *Green ſickneſs*, &c. by which the Cure will be facilitated, and the pale-faced Patient brought to a lively Complexion.

But if there is a virulent Acrimony contracted, then a more Appropriate medicine is alſo requiſite; for this *Spaw* will not reach the remote receſſes of the *Genus Nervoſum*. So that Specificks of a penetrating nature and abilities to correct the Enormities of the Digeſtions ſubſequent to the Stomachical, with Catharticks to purge off the *fæces* and dregs of our Bodies, muſt neceſſarily be required.

Seventhly, this *Spaw-water* drank will help to cleanſe and purifie the Blood, and may be uſed with good ſucceſs in Diſtempers proceeding from a ſaline acrious Humor, or from Obſtructions in the *ſecond Digeſtion*. But neither Chalybeats nor Spaw-waters will help the Diſaſters of the Animal Spirits ſuffering in their abſtruſe Paſſages. It may as a *Subalkalizate* correct a ſpurious Acidity in the blood, and by opening the obſtructed veſſels as a Diuretick carry off much of the recremental *ſordes* of the blood, and ſo as a Remote Cauſe help to prevent Diſeaſes proceeding from exorbitant ſaline Humors, ſuch as the *Gout*; but cannot reduce the coagulated Salts from the *Synodia* of the Joynts, nor correct the ſpurious Acidity that hath reached the *Genus Nervoſum*, when the *Gout* attended with direful Symptoms doth appear.

Neither can this Chalybeat water reach the Morbifick Diſpoſition or Seminal *Idea* of the *Gout* (more eſpecially in perſons to whom it is Hereditary) which only wanteth an Acid ferment to bring this latent Enemy upon the open Stage. This latent Seed will ſhew it ſelf in growth as often as it is excited by Saline Agents, ſuch as Salt-beef, Stale beer, French Wines, *&c.* Which morbid *Idea* firſt laid by the *Archeus*, is beyond the Power of any Spaw-water or Chalybeat, but requireth more noble Balſamick *Arcana*.

I ſhall now ſum up the Vertue of this *Spaw-water*, as *Van Helmont de aq. Spad. Parad. quint.* doth of the *German* Spaws, *Pawhont* and *Savenir*, and of all ſuch that take their Medicinal vertue from an Eſurine Salt, and a diſſolved *Minera* of Iron.

This *Spaw* aſſiſted with Cathartick will help their Stomachs that are loaded with a mucous Matter, and free us from a viſcous filth that hath entered the more ſecret Receſſes of the veins and *viſcera*; but the more difficult, the more remote from the mouth. It may be uſed with good ſucceſs in obſtructions of the *Liver*, *Spleen*, *Reins*, and *viſcera* of the middle and lower Region, and Diſeaſes thence depending, and may be of excellent Uſe to correct the Scorbutick dyſcraſie of the blood, and all Diſtempers proceeding from an exorbitant Acid, and Tartareous Humor, by obſtructions perverting the Temper of the blood.

Van Helmont (in the place before cited) determineth the *Spaw-waters* in the Sphere of their Activity. *Poteſtas Aquarum non tranſcendat Hypochondrium. Non enim ſupra Renes, ad Cor videlicet, Pulmonem, aut Cerebrum Aquæ attingunt: quocirca etiam affectibus illis ex idiopathia genuinis niſi per accidens ſuccurrunt Spadanæ.* And a little after, *nec Potæ Spadanæ in Epidemicis, Endemicis, & Aſtralibus morbis, ut ſunt Peſtis, Pleuritis, Prunella, &c. neque conferunt plurimum quibus venenum ſubeſt, vel aſſumptum vel intus genitum vel contagio participatum, neque in morbis Tincturæ, quales ſunt Lepra, Lues Veneris, Morphea, Cancer, Epilepſia, &c.* But for my part, I cannot adhere to his Opinion, *viz.* That *we muſt not expect Cure of Diſeaſes that proceed from a higher Rank than the* viſcera *of the* Abdomen: For it muſt needs be granted, that *Diureticks* enter the Blood-veſſels, and the blood in its Circulation doth paſs through the Heart, yea like a Torrent waſheth all parts of the Body. Yea we are not ſure of any veſſels to convey this Water drank or ſerous Humors from the Stomach or Interſtices immediately to the Kidneys, but before it can enter the blood-veſsels muſt be conveyed above the *Hypochondrium*, and by the Circulating blood may be hurried to all parts of the body, until by Tranſpiration, Sweat, or Urine it is ſeparated: and whilſt mixed with the Blood may by its Active principles of Salt and Sulphur working upon the blood alter its depraved *Craſis*, and reſtore it to a well-poiſed Temperament. But though it may with the blood be carried to the remote Parts from the Heart, yet thence it will not follow, that this Spaw-water is able to reach and cure the Maladies of the *Brain* and *Genus Nervoſum*. For beſides the Contrariety of its Saline Principle to that of the Brain, a Watery blood is an unfit Subject for the elaborating of Animal ſpirits. When inſtead of pure Blood a deluge of Water is ſupplied by the Arteries, the Brain ſeemeth as it were overwhelmed, and Nature to ſuffer: as may be concluded from the frequent obſervation of Water-drinkers, that after large quantities taken do feel a dulneſs and heavineſs of Head, ſtupidity, and other infirmities incident to the Brain, and its *Appendices* the Nerves, according to the previous inclination of the

Patient, either towards a *Palſie*, *Lethargy*, *Apoplexie*, &c, But this happeneth uſually when the *Water-drinkers* proceed headlong, without preparing their Bodies, or being regular in their Water-courſe, or taking Purges to carry off the Water lodged long in the blood, and the *fæces* that may cauſe Obſtructions, or conſidering their Habit of Body and Inclination. Upon which accounts they may as ſoon drink for their Ruine as for the reſtoration of Health. Which may be ſpoken by way of Caution, but more of This in the next Section.

Inſtances might be produced of ſeveral Perſons, that by drinking Chalybeat Waters have found relief from an *Aſthma*, *Epilepſie*, *Palſie*, and many Diſtempers derived from a Pravity of the Brain and Nerves. But then as *Helmont* rightly adviceth, we muſt diſtinguiſh Diſeaſes and their Cure by their true Cauſes. For Example, upon obſtruction of the *Menſes* in women there may enſue an *Epilepſie*, *Aſthma*, or *Palſie*, and the *Spaw water* by provoking the Menſtrual Courſe may free the Patient: yet we muſt not recommend the *Spaw-water* as a uſual Specifick to cure the *Epilepſy*, *Apoplexie*, *Aſthma*, or *Palſy*; for what is done as a Procatartick Cauſe, and upon a ſecondary Conſequence cannot be a Specifick, nor anſwer the Primary Intentions of Cure. Accordingly then muſt we ſtear our courſe, and act with reſpect to the true Cauſe. For theſe Diſtempers proceeding from an ill-affected *Uterus*, are far different from theſe that are common to both Sexes.

Whatever *Helmont*'s Spaws might be (which, ſaith he, took their vertue from an Eſurine Acid and a diſsolved *Minera* of Iron) as to Uſe *in morbis Tincturæ*, under which he comprehendeth the *Leproſy*, *Morphy*, &c. I ſhall not take upon me to determine: but yet do ſee no reaſon why this at *Ilmington* may not be beneficial in a *Leproſy*, that proceedeth from an acrious corroding Humor, eſpecially when applied in external Waſhings.

Of what excellent Uſe are Vitriolick Waters for the cure of old running ſores Chirurgical Practice may teſtifie, and many already by the waſhing at this Spring. To which agreeth the Teſtimony of *Agricola* ſpeaking of Atramentous Waters, (which are ſuch that tinge with Galls,) *Aquæ atramentoſæ ſive ipſum Atramentum ſutorium combiberunt, ſive Miſy, ſive Chalcitida, ſive* Sory, *ſive Melanteriam, eaſdem vires habent quas Aluminoſæ, multo tamen efficaciores, quòd multa acrimonia cum aſtringendi vi ſit conjuncta. Quâ de re etiam proſunt Ulceribus, quæ paſcendo ſerpunt.* Agric. *de natur. eor. quæ Efflu. ex ter. lib.* 2. So that he concludeth all Vitriolick waters more excellent as to the Cure of corroding Ulcers and other Diſtempers than Aluminous; whoſe vertues he reckoneth to cure the ulcer of the Bladder, to help a weak Stomach ſubject to vomiting, to cure the inordinate Courſes in Women, Abortions; Ulcers of the Mouth, ſwelling of the Gums, weakneſs of the Nerves, (by waſhings I ſuppoſe,) effuſions of Blood, and immoderate Sweatings.

V PART.

PART III. SEC. 4.

I Shall now proceed to propoſe a method to be obſerved by the Drinkers of this Spaw-water; which I ſhall do, *Firſt*, by way of Caution, ſhewing ſome ill Conſequences to the raſh undertaking a Water-courſe; *Secondly*, by laying down ſome Rules how to prevent theſe inconveniences, and to drink the Water with good Effect,

I might refer the Reader to *Van Helmont Parad. ſext. de Aq. Spad.* and many other Eminent Authors, that have given good Directions for the right Uſe of Chalybeat Waters. But this *Section* is chiefly deſigned for the Poor Countrymen, who moſt commonly are incapacitated to apply themſelves to ſuch Authors: yet were their Abilities ſo great, different Springs do require different Directions; eſpecially this *Spaw*, that is ſo highly impregnated with a Mineral. Beſides, I obſerved many poor People reſort to the *Spring*, that could not require the Advice, much more the Attendance of a Phyſician except upon meer Charity; yet they boldly undertook the drinking of a large quantity of this Spaw-water, without preparing their Bodies yea for any Diſtemper; neither with Advice nor Phyſick, but proceeded with their own confidence, or rather Ignorance, and might as well have drank for the Deſtruction as Preſervation and recovery of their Health. For upon raſh Undertakings in this kind, theſe Ill conſequencies may enſue.

Firſt, this *Spaw-water* containing in it a great quantity of *Ocre* or *Terra Metallica*, (for out of a Quart of this Spring-water I have got the beſt part of a Spoonful of an Earthy ſediment) which being drank with the Water, although as I have proved by the Experiments on the *Spaw*, it is not a ſimple Earth, but containeth much of the Salt of the *Minera* and of the *Menſtruum*, may endanger the Drinkers with Obſtructions in the Capillary blood-veſſels, or in the Lacteals conveying it from the Inteſtines to the Blood. And what may be the Reſult from Obſtructions perverting the right uſe of the Spleen, Liver, or other *viſcera* of the middle and lower Region, I have above *Par.* 3. *ſec.* 2. & 3. ſufficiently hinted. But if the *Sediment* enter not the Lacteal veſſels, it muſt needs load the Inteſtines of theſe (it being not Purgative) that drink it without Phyſick or Advice.

Secondly, Too frequent drinking of this *Spaw* and alſo of other Mineral waters in a large quantity, and eſpecially when not taken *gradatim*, will relax the fibres of the Stomach, extend the veſſels and other membranous parts, upon the Relaxation of the Stomachical fibres a loſs of Appetite will enſue; and upon the Extenſion of the blood-veſſels, Lympheducts and Membranous parts, will follow *Wearineſs*, *Difficulty of Breathing*, and Increaſe of a *Dropſie* in them that are far gone, beſides other Diſtempers according to the Inclination and Habit of the body.

Thirdly, This Water like moſt other Vitriolick will cauſe a *Vertigo* or light giddineſs in the Head, eſpecially in them that unprepared drink it to the quantity of three or four Quarts at the firſt onſet. Not only a *Vertigo* but alſo a *Lethargie*, *Apoplexie*, or other Cephalick Diſtempers, cauſed by an oppreſſion of the Brain and ſtoppage of the Animal ſpirits, may enſue the taking of a large quantity, when neither *fæces* nor the reſtagnating water are carried off.

I ſhall therefore propoſe this Method to the Drinkers of this *Spaw water*, for the avoiding of theſe Enormities; yet ſhall not be Dogmatical, but leave the Phyſician to direct his Patient according to the Indication of the Diſtemper, and thereby directing his judgmen. And

Firſt, Purge off the Recremental *ſordes* of the Stomach and Inteſtines; but rather (if the habit of body and ſtrength will bear it) begin with a Vomit: Such as a Doſe of *Sal Vitrioli*; the Quantity is uſual from One ſcruple to Four, but may be increaſed or diminiſhed according to the condition of the Patient. This Medicine I propoſe, becauſe it uſually worketh both by Vomit and Siege; and not only cleanſeth the *viſcera* of the *Abdomen*, but alſo by its *Stipticity* will notably fortifie the membranous fibres of the Stomach againſt Relaxation, that often enſueth upon drinking large Draughts of Water, and alſo it will help to reduce the fibres to their proper ſtate when too much extended, and conſequently are weak and unfit to embrace the Aliment taken in at the mouth. The fibres of the Stomach and Inteſtines being well fortified will the betrer contain a large quantity of Water without Relaxation, and by the Periſtaltick motion of the Guts the Lacteal veſſels will ſooner imbibe the Water when their Orifices are ſcoured and like the little holes in a cleanſed Strainer. Yet other Catharticks accordiug to the particular caſe of the Patient may be requiſite.

Secondly, Then begin to drink of the Spaw-water. They of an ordinary Conſtitution may begin with a Pint, but they of a ſtronger with a Quart or three Pints, and ſo increaſe each morning a Pint until they come *gradatim* unto four Quarts, which may be the meaſure for a ſtrong Conſtitution; and as ſome few may exceed, ſo many may fall ſhort of it. Thus may they continue in their Water-courſe for a Month, and ceaſe *gradatim* as they increaſed at firſt, leſt there ſhould be left a diſtention of the fibres and membranes.

But withal obſerve, That the Water muſt not be drank to its full Doſe at once, but rather with walking up the Hill, or moderate Exerciſe after every full Draught; that it may have time to ſearſe through the Drinkers body, eſpecially until it begineth to ſhew it ſelf by its Diuretick faculty. For the ſudden drinking of a large quantity will cauſe a diſtention of the Stomach, with cruel *Tormina* or Gripings in the bowels.

Thirdly, In caſe the Water lieth long and heavy on the Stomach and Inteſtines, and at laſt worketh off in a Diarrhe or looſneſs, it ſignifieth the body to be unprepared, and probably Obſtructions in the Meſentery or *viſcera*: which requireth a Preparation by ſome De-oppilative Pills or Medicine, with convenient Solutives to carry off the feculent Matter. But in theſe caſes I cannot lay down any one Preſcription general ſerving for particular Perſons, that according to their Diſtempers muſt have different Directions from their Phyſicians.

Fourthly, Becauſe of the great quantity of Ocre or Vitriolick Earth contained in this Spring-water, let the Drinkers hereof obſerve to take at leaſt twice a week a Doſe of Phyſick to carry off the filth of the water, free the Stomach and Inteſtines from incruſtation of the Earthy ſediment, and the veſſels from Obſtructions. But the Water-drinkers muſt forbear the *Spaw* on the days he deſigneth for Purgation; except he take ſuch a ſmall quantity of Pills *&c.* on the over-night, or very early in the morning, only to keep his body from being Coſtive. For which purpoſe *Van Helmont* recommendeth a Doſe of *Ruffy Pills* (the Doſe may be from a Scruple to a Drachm) taken three days together in the morning before drinking of the waters. This he adviſeth for the *German*-Spaw, *Pauhont* and *Savenir*, whoſe Mineral Ingredients are like this at *Ilmington*, though not ſo highly impregnated as this new found *Spaw*. *Ruffy Pills* may be of good uſe to purge off the filth of the *viſcera*, and alſo the ſediment of the Water, and being gentle in operation may be taken on the over-night, or in the morning deſigned for drinking the Water. But according to the Obſervations of Phyſitians, undoubtedly the beſt method will be, to compoſe Pills (or Phyſick in ſuch form that the Patient ſhall like beſt) of Deoppilating Ingredients and Antiſcorbutick, or with ſuch Specificks that may anſwer the Indication of the

Patients Diſtemper, but yet with ſuch purgative Ingredients that may make the body ſoluble to the number of three or four Stools, and may be taken through the Water courſe,

Fifthly, For a more ſpeedy paſſage of this Water through the body, let the Drinkers take a Glaſs or two of good White or Rheniſh Wine, about an hour or ſomething longer time after the full Doſe of Water is drank. This is convenient, but eſpecially for them, upon whoſe Stomachs and *viſcera* the water lieth long and heavy; and if the water lieth ſtill lodged in the veſſels and habit of body, Cathar ticks and Diureticks may be helpful.

As the waters drank in a regular courſe will increaſe (but eſpecially for a time) the Appetite after meat, or Hunger; ſo an irregularity in Diet in a Water-courſe will not only take off the Appetite, but may alſo lay a foundation of many Diſtempers, yea may produce more Evils than the Water is able to correct. Wherefore I ſhall propoſe ſome Obſervables about Diet.

Firſt, Faſt at leaſt two or three hours after drinking the Waters, that they may have time to paſs off but by eating too ſoon may hinder the Digeſtive Ferments in their Operation, or mix with the Chyle, and ſo be carried into the Habit of the body, and leave much of the feculent *ſordes* in the remote parts, that may endanger the Drinker with a Fever Dropſie, Scurvy, or Obſtructions very difficult of Cure.

Secondly, Take that Advice of *Helmont de Aq Spad. Parad.* 6. *ſect.* 5. *Spadanas bibenti conſulo, ut ſobrietati conſulat, edatque parcè inſtar Accolarum.* And a little after, *Eâ ſolâ Diætæ normâ Aquæ permeabunt tutò, celeriter, ac jucundè. ſec.* 7. Whereby Moderation in Eating and Drinking is recommended, leſt that by over-glutting the ſtomachical and ſubſequent Digeſtions ſhould be over-powered and unfit to perform their proper functions, which of neceſſity muſt cauſe future Enormities. For in moſt caſes over-charging Nature will pluck down Health faſter, than the Phyſitian is able to repair.

Thirdly, Meat well ordered and of an eaſie digeſtion, muſt be obſerved in all theſe Courſes of Phyſick. For well known it is, that Salt meats and Seamens fare will alter the ſweet Temper of the Blood into a ſaline ſcorbutick Ferment; which, if continually ſupplied, will be able to withſtand the Operation of a *Vitriolum Martis*.

Fourthly, The Drink is to be of a middle ſort; not too ſmall and thin to depauperate and dilute the blood, nor too ſtrong to over-ferment it; not too ſtale and ſharp to produce an Exotick Acidity, nor too muddy to fill the veſſels with a *fæces*; but rather clear mellow Ale, and now aud then a Glaſs or two of good Wine, that will be a convenient Vehicle for the dry Aliments, and fit to renew the ſweet Balſamick temper of the Blood.

Laſt of all I ſhall adviſe the Drinkers hereof to uſe ſuch Specificks in their Water-courſe, as ſhall be peculiar to their Diſtempers; beſides Solutive Pills to carry off the *ſordes*, that the depraved Ferments of the body may be amended. For ſo long as the *Diet* is good, and regularly taken, and the Ferments of our Bodies are entire, Health will remain ſafe and ſound.

FINIS.

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